3RD UNIVERSITY 1930

The Desmids of the Southeastern Coastal Plain Region of United States

---

DISSERTATION

PRESENTED IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF DOCTOR OF PHILOSOPHY IN THE GRADUATE SCHOOL OF THE OHIO STATE UNIVERSITY

BY

HELEN JEAN BROWN, B. A., M. A.

LC

STANFORD UNIVERSITY LIBRARIES
WITHDRAWN

THE OHIO STATE UNIVERSITY
1929

(Published 1930.)

3781
037B
UNCLASSED
Dissertation

The Desmids of the Southeastern Coastal Plain Region of United States

---

DISSERTATION

PRESENTED IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF DOCTOR OF PHILOSOPHY IN THE GRADUATE SCHOOL OF THE OHIO STATE UNIVERSITY

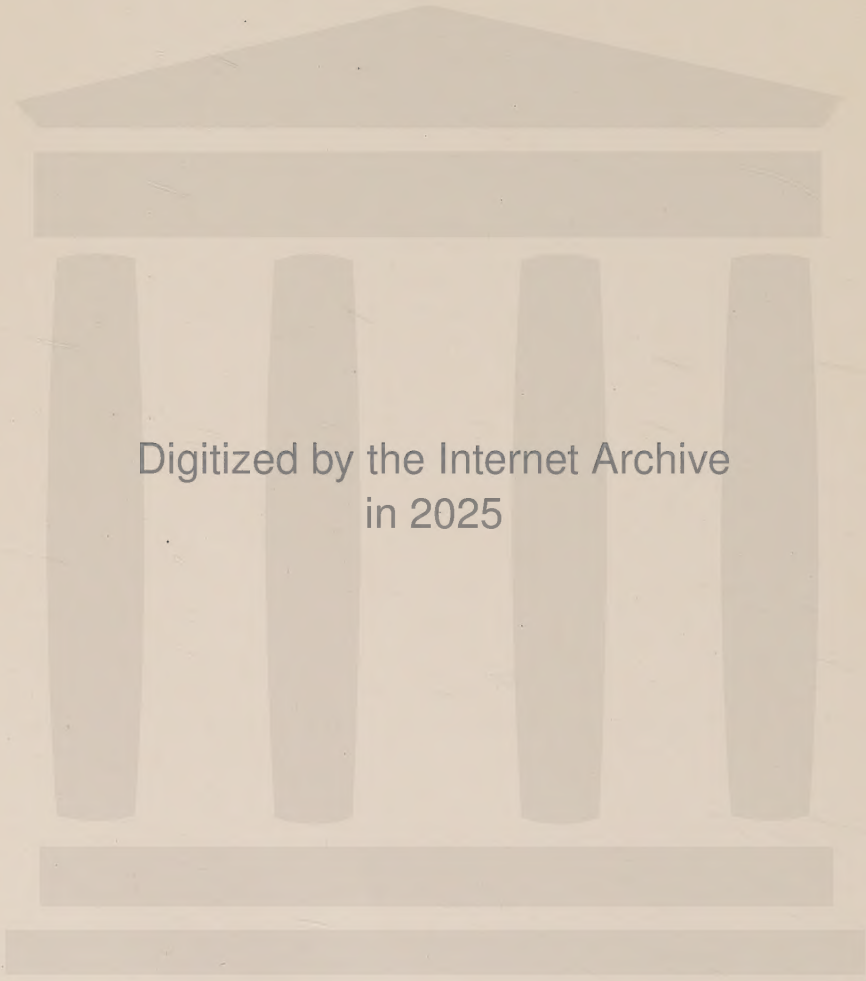
BY

HELEN JEAN BROWN, B. A., M. A.

THE OHIO STATE UNIVERSITY

1929

(Published 1930.)


Digitized by the Internet Archive
in 2025

https://archive.org/details/desmidsofsouther0000hele

Reprinted from TRANSACTIONS OF THE AMERICAN MICROSCOPICAL SOCIETY
Vol. XLIX, No. 2, April, 1930

THE DESMIDS OF THE SOUTHEASTERN COASTAL PLAIN REGION OF UNITED STATES*

HELEN JEAN BROWN

Department of Botany, Ohio State University, Columbus

This paper presents a list and summary of the distribution of the Desmidiaceae of the eastern and southern coastal plain of the United States. The coastal plain extends from Cape Cod southward across the Florida peninsula, and the states bordering the Gulf of Mexico as far west as Texas. This area is essentially a single ecological region although not dominated throughout by the same plant associations. From Delaware to Louisiana the region is dominated by the Southern Evergreen Forest; while the northern portion from Cape Cod to New Jersey is dominated by the conifers and oaks of the deciduous forest. Many of the higher plants peculiar to the southern coastal plain extend as far north as Cape Cod.

Of the four hundred twelve species of algae identified in the collections from this region, two hundred twenty-five belong to the family Desmidiaceae. This unusually high number of desmids indicates the region to be one of the richest regions yet worked in North America. The filamentous green forms identified in this region will be included in a later paper.

The collections, from which the systematic list was prepared, were made by Dr. E. N. Transeau from the states of Louisiana, Mississippi, Alabama and Tennessee in the spring of 1925; on Long Island, New York, in the summer of 1924; and by Dr. W. M. Barrows in Florida during February and March 1925. Thanks are due to Dr. Transeau and Dr. L. H. Tiffany for aid in checking some of the identifications.

The collections from Long Island, New York, were made in the months of July and August from acid (pH 6.2) spring bogs generally; the col-

* Published with the aid of a grant from the Spencer-Tolles Fund.

This paper is part of a thesis presented in partial fulfillment of the requirements for the degree of Doctor of Philosophy in the Graduate School of the Ohio State University.

Papers from the Department of Botany, Ohio State University, No. 258.

lections noted from Lake Ronkonkoma, Long Island, were taken from a region of acid lakes. The ones from Louisiana, Mississippi and Alabama are mostly from streams, ponds, and lakes in the flood plain region of the Mississippi river. Some of the collections, such as those from Mt. Mitchell, a few miles from Asheville, North Carolina and Montvale, Tennessee, were included because of the possibility that they were new records for the states concerned. All of the collections from the south were made in March, April and the first week of May, representing only a small part of the growing season for algae.

The American literature dealing with the algae of the Coastal Plain is very meager. The first paper by Bailey in 1850 described collections from approximately sixty different places in South Carolina, Georgia, and Florida in which he listed over one hundred desmids. Wood (1872) listed a few species from the coastal states, while Poteat (1888) named some eighty species of desmids from a small area in North Carolina. Collins (1909) gives a few localities in this region for some species. These few papers are all that have been published on this vast area. Of course, the New England states, Long Island, and New Jersey have been investigated by Cushman (1903-1905), Conn and Webber (1908), and Hylander (1928).

A list of the desmids present in the collections has been prepared, to which has been added the general distribution of the forms, as far as could be learned from the papers cited in the bibliography. Of the 238 forms in the list, 2 are described as new and forty-six have not been recorded previously from the United States. The new forms are: *Plurotaenium maximum* var. *tumidum, Micrasterias truncata* var. *major. Euastrum wollei* Lag. was found in the collections, thought at first to be a new species, but later found to agree with the rather meager descriptions of Wolle and Lagerheim (1886), a complete description and figures are here given for this species.

The 46 forms, varieties, and species which are here included but are not previously recorded for the United States, are designated with an asterisk in the systematic list at the close of this paper.

Distribution of Desmids

Geographical. It is not the purpose of this paper to discuss the physiological factors controlling the distribution of algae, but merely to enlarge our knowledge of their geographical range. The abundance of desmids in this region, however has led to the inclusion of quotations from other workers as to the factors controlling the distribution of desmids in Europe and the tropics.

The idea seems to be prevalent that of all the freshwater algae, the group Desmidieae is the only one which has a distinctive geographical distribution. It appears that either this idea was advanced too soon, before representative

collections had been examined from all parts of the world, or that the number of cosmopolitan desmids must be extended.

Strom (1926) observes "In the desmids, we encounter the main part of the freshwater algae which have a geographical distribution in the same sense as the higher plants. This fact has not always been clear, as the larger part of this group are cosmopolitans, perhaps two thirds of the known species, but the remaining part consists of species which have their more or less sharply limited areas of distribution, and these are especially found in the tropics." An analysis of the geographical distribution of the species listed in this paper makes it extremely difficult to apply Strom's observation to the Coastal Plain Desmids. Perhaps there would be a closer agreement if the collections had been made over a period of years, during the entire growing season of algae; such an extended investigation would greatly enlarge the number of desmid species.

Of the desmids here recorded, 55 species can be listed as cosmopolitan, i.e. occurring on every continent more or less abundantly, while 44 have been found on every continent but Australia and Africa. The latter statement may be due to the fact that the data from these continents are very meager. Of the remaining species there is a great variance as to their distribution; 10 species have been found only in Europe, Greenland and the United States (northern countries in general); 4 have been previously recorded only from Europe and Asia; 16 have been found only in Europe, United States and South America; the remaining 98 have been recorded from various continents. *Closterium turgidum* var. *giganteum* (Ehrenb.) Nordst. was noted in Brazil by Borge while *Penium minutum* var. *crassum* forma *inflata* West was recorded only from Africa. Both species occurred frequently in these collections.

The higher vegetation of the coastal plain is temperate in character but includes many subtropical species along the coast. The algal flora is similar in character. In many respects it resembles the tropical flora summarized by Fritsch (1907b). In Ceylon he noted that filamentous desmids play an important part in the algal vegetation of the lowlands. In the coastal plain collections, with few exceptions, the collections contain a large number of filaments of *Hyalotheca dissilens* (Sm.) Bréb. and *Gymnozyga moniliformis* Ehrenb. Two species of Pleurotaenium occurred as filaments of from three to sixteen individuals joined together, while *Microsterias foliaceae* Bail. (a filamentous species) occurred abundantly in the collections from Lake Ronkonkoma, New York. The large number of filamentous forms is particularly noticeable, and none of these forms were rare in the collections in which they were noted. Fritsch in explanation of the large number of filamentous desmids in the tropics says: "This phenomenon may be due to the poor aeration of the water, the presence of little dissolved oxygen appearing to encourage

filament-formation. This must be left to experiment for verification, but it would certainly explain the relative abundance of desmids in tropical waters."

In the tropics Fritsch again notes that species of Spirogyra, Oedogonium, as well as Bulbochaete, were present in almost every collection. This is also true of the coastal plain. All three genera were abundant in the majority of samples, although often only in the vegetative state; but from the list of species of Oedogoniaceae and Zygnemaceae, (not here recorded), one can see that a large number were fruiting at the time the collections were made, because identifications in these two families can only be made when fruiting filaments are present.

In the above statements, it is difficult for the writer to come to any conclusions regarding the idea of a distinct geographical distribution for these species in the coastal plain region. When one finds many so-called alpine species, which as yet are not listed as cosmopolitan, and many species, heretofore believed to be peculiar to the tropics, it is difficult to correlate the results. One hundred twenty of the same forms, which were found by Strom in the Norwegian Mountains at altitudes of not less than 2,500 feet, were also found in my collections, thus showing that the great majority of them have a wide ecological range. The "prophecy" that was made by Strom (1926 p. 45) can certainly not be verified from the species in these collections, namely "When approaching the subtropic regions a more local and genuinely geographical character may be apparent, such as for instance, in the southeastern part of the United States."

As regards the matter of distribution West in 1899 writes: "In speaking of the world-wide occurrence of the same forms as *Equastrum trigibberum* W. & G. S. West in Madagascar and the United States, there is but one conclusion to be drawn from the facts, viz., that such a species has been perpetuated by two isolated communities which were derived originally from one assemblage, and that the individuals of these communities have retained their original characters in an extraordinarily constant manner. It must be admitted in all probability that a vast period of time has elapsed since the original distribution, and that the Desmidieae have existed through a vast period of time in much the same forms as they exhibit at the present day is highly probable."

Concerning the wide distribution of the desmids, Strom (1926) says: "Many, perhaps the most, desmids cannot withstand transport when really dried up, except as zygospores and these are rare in the majority of species. Transport by wind therefore remains little probable. So much the greater am I inclined to regard the importance of swimming and wading birds as distributing agents. In the only half-dried up mud, often so plentiful on their feet the desmids may be transported for long distances. Willie (1922) also emphasizes this fact, though he doubted whether a transport over distances

such as across the North Sea is generally possible. If however, only very occasionally a species succeeds in coming over, this will in the course of centuries be more than enough for the migration of the essential part of the desmid-flora."

Relation to Underlying Rocks. West (1908) in explanation of what he considers a rich Desmid-area says: "We do not apply the term 'rich' to a mere abundance of Desmids, or even to the occurrence of a great quantity of 30 to 40 species, but only to those areas in which 150 to 200 (or even 300) species can be found in more or less abundance, including many of the rare species with a restricted distribution." These collections would certainly come under this definition of "rich," as the number of species of Desmids was large and there were many forms which the writer did not feel competent to identify to species names, especially some members of the genera Staurastrum and Cosmarium.

West states further that two facts stand out clearly in an attempt to correlate the conditions of environment with the richness of the Desmid-flora: These are (1) rich desmid-areas correspond very accurately with the areas of the old geological formations and (2) these areas also correspond, but with less accuracy, to the areas of greatest rainfall.

In comparing the "richness" of desmids in the eastern and western bogs of the British Isles, where the conditions of habitat and rainfall are almost identical, the conclusion is drawn that "in the British Isles the really rich desmid-floras, containing many of the Western British types, are found in those areas which combine the most suitable habitats (such as are found on boggy hillsides with an abundant rainfall) with a drainage-water derived from geological formations older than the carboniferous." West suggests in this relation that a chemical investigation of the waters of bogs and lakes in different areas might throw further light upon the question of distribution. The absence of lime was suggested as a determining factor in the abundance of desmids and might restrict their distribution in the western part of the British Isles.

Regarding the continent of Europe, West (1909 p. 203) says that the antiquity of the geological formations is a special factor in the occurrence of desmids as a whole. "One does not expect an abundance of Desmids in the plankton of the large Swiss lakes. They are situated in poor Desmid-areas, and in North Switzerland the geological formations are for the most part too recent. Most of the Central European lakes are situated in areas relatively poor in Desmidiaceae. In Denmark the formations are Cretaceous and Jurassic, largely overlain by drift, and similarly the lakes of Northern Germany are situated on immense areas of drift, overlying comparatively recent formations. Hence the dearth of Desmids in the lakes. On the other hand the Scandinavian lakes are situated on the old formations, and con-

tain an abundance of Desmids, many of which are identified with those of the British lake-areas."

The work which has the most direct bearing upon the conclusions of West are those of Strom, briefly stated in 1924 but greatly enlarged and extended in 1926. He realizes that the qualitative richness of the aquatic vegetation is more directly concerned with the physical and chemical properties of the freshwater medium than with the antiquity of the geological formations. From his work the facts indicate that "the hydrogen-ion concentration must be regarded as an essential factor, provided that tolerable climatic conditions exist, and it (pH) is generally but not exclusively determined by geological formations. As a whole, qualitative richness of the flora is mainly determined by the occurrence of desmids, it may in general be said that the rich flora is found chiefly on the old geological formations as well as on younger eruptives, quartzites, etc., whereas the flora on limestone is poor. Already in 1880 Wille was aware of this important fact, and later on West described in detail the conditions in the British Isles. His researches have strongly confirmed the view, though it seems that the real connections between the geological formations and the algal flora never occurred to him. This generalization, however, requires a considerable extension. In smaller bodies of water, especially, it is not exclusively the underground which determines the reaction of the water, but also the respiration and assimilation of plants and animals as well as the aeration or stagnation, and last but not least, the qualities of the soil proper."

Strom further observes that a rich flora of calciphob algae may be found among the littoral and bottom vegetation of ponds in a limestone district. That the four factors determining the alga-flora are temperature, aeration, salt contents, and contamination (organic Nitrogen). "The majority of the Desmids occur in the districts poor in lime in all localities, but most abundant in those moderately aerated with a reaction approaching the neutral. In the lime-rich districts they only occur in any real qualitative abundance in the localities which are more or less self-contained, and not directly influenced by the geologic strata, i.e., in the acid peaty bogs, though they are never so richly represented there as in the clear waters."

In 1926 Strom considered the Norwegian Mountain Algae in much detail in relation to meteorological, geological, and ecological data. Numerous tables are given for each habitat containing a list of algal species, the pH of the water, and the altitude of the situation. A summary of ecological data has been given for each species found and presented in a systematic account at the end of the work but no generalizations are made as to the exact relation of the hydrogen-ion concentration of the water to the desmids in general. Donat (1926) working in the northern part of Germany has devoted much space to a discussion of the various associated species which he

found in a habitat, with an analysis of the water for that habitat as to pH and chemical content. Wehrle (1927) made a study of the hydrogen-ion concentration of waters in the region of Freiburg, Germany, classifying them as to pH range.

The idea that a rich desmid-flora can only be found on old geological formations does not hold good for the eastern and southern Coastal Plain of the United States. These collections, for the greater part, have been made from lakes, pools and streams on deposits of Tertiary or later origin, as can be seen from the maps by Pirsson and Schuchert.

As regards the rainfall, the supply of moisture for the southeastern states comes almost exclusively from the Gulf of Mexico. The amount of yearly rainfall varies between the extremes of 28 to 64 inches; over the greater part of this area it varies between 40 and 60 inches.

The abundance of desmids in the coastal plain seems to correlate well with the wide distribution of acid sand and clay soils. It contrasts strikingly with the paucity of desmids in the central states region from Iowa to Ohio, and is similar to the abundance in the pine barrens of northern Michigan. This distribution suggests that slightly acid waters are more important than temperature or underlying geologic formations in limiting the occurrence and distribution of desmids.

List of Desmidaceae with Geographical Distribution Arranged by Genera

Under each species is given (1) the geographical distribution in the coastal plain region of the United States as found in the collections examined by the writer, and (2) the world distribution according to the literature.

***Spirotaenia minuta** Thuret.

Ditch near Fourth Lake, Cold Spring, New York.

Europe: British Isles, France, Germany, Austria, Norway, Sweden, Latvia.

Spirotaenia obscura Ralfs. **Pl. XI, fig. 5.**

Bog south of Cold Spring Harbor, New York; also a side hill swamp near the same place.

United States: North Carolina; Europe, Spitzbergen, Nova Zembla, Brazil.

Cylindrocystis crassa De Bary.

Ocean Springs, Mississippi.

United States: Connecticut, New Hampshire, Maine, Massachusetts; Europe, India, Madagascar, New Zealand, West and South Africa, South Orkneys, Antarctic.

Netrium digitus (Ehrenb.) Itzigs. and Rothe. **Pl. XI, fig. 6.**

Abundant in various collections. Amory, Mississippi; Aberdeen, Mississippi; S.E. of Jackson, Mississippi; Pascagoula, Mississippi; Walker Lake, West Point, Mississippi; Auburn, Alabama; Montvale, Tennessee.

United States: Connecticut, Massachusetts, New Hampshire, Maine, Rhode Island.

Ohio, Michigan, Colorado, Wisconsin; Newfoundland and Ontario, Canada. Occurs on all the continents, recently found in South Africa by Fritsch (1923).

Netrium interruptum (Bréb.) Lutkem.

Auburn, Alabama.

United States: Connecticut, New Hampshire, Maine, Massachusetts, North Carolina; France, Germany, Austria, Italy, Hungary, Switzerland, Norway, Sweden, Russia, Latvia, Lapland, South Africa.

Netrium oblongum (De Bary) Lutkem.

Baton Rouge, Louisiana.

United States: New Hampshire, Massachusetts, North Carolina; Germany, Austria, Hungary, Switzerland, Norway, Sweden, Lapland, Faeroes, India, West and East Africa, Somaliland, Ecuador, Brazil.

Netrium oblongum var. **cylindricum** W. and G. S. West.

Cold Spring Harbor, New York.

United States: New Hampshire; Italy, British Isles, Norway, Somaliland, South Africa.

***Penium cylindrus** var. **subtruncatum** Schmidle.

Birmingham, Alabama.

Europe.

***Penium libellula** (Focke) Nordst.

Auburn, Alabama.

United States: New Hampshire, Ohio; Europe, Asia, Brazil, Faeroes, Greenland, Ceylon, Singapore, Java, New Zealand.

***Penium libellula** var. **interruptum** W. and G. S. West.

Sphagnum bog, Woodberry, New York.

England, Scotland, Germany, France, Ceylon, Singapore.

Penium margaritaceum (Ehrenb.) Bréb.

Cold Spring Harbor, New York; Lake Joanna, Mt. Dora, Florida; Starkville, Mississippi; Baton Rouge, Louisiana.

United States: Connecticut, Rhode Island, Massachusetts, New Hampshire, New York, Ohio, Wisconsin, Illinois, Indiana, Michigan, Kansas, Alaska; every other continent.

Penium minutum (Ralfs) Cleve.

Caldwell's Pond, Amory, Mississippi.

United States: Rhode Island, Massachusetts, New Hampshire, South Carolina, Florida, Wisconsin; every other continent.

Penium minutum var. **crassum** West.

Mobile, Alabama.

United States: Florida; British Isles, Lapland, West Africa, Brazil.

***Penium minutum** var. **crassum** forma **inflata** West.

Side hill spring swamp, Cold Spring Harbor, New York.

Africa.

* Species which have not previously been recorded in the United States.

Penium minutum var. **gracile** Wille. **Pl. XI, fig. 13.**
Cold Spring Harbor, New York.
United States, Cuba, Norway, Lapland, West Africa.

***Penium minutum** forma **major** Lund.
Lake Ronkonkoma, Long Island, New York.
Scotland, Ireland, Austria, Sweden, Brazil.

Closterium abruptum West.
Baton Rouge, Louisiana.
United States: Connecticut, Maine, New Hampshire, Massachusetts; Germany, Austria and Galicia, Norway, Switzerland, Colombia, Brazil, Central and South Africa.

Closterium acerosum (Schrank) Ehrenb.
Jackson, Mississippi; Cold Spring Harbor, New York.
United States: Maine, Massachusetts, New Hampshire, New York, Connecticut, Pennsylvania, Ohio, Michigan, Illinois, Indiana, North Carolina, South Carolina, Georgia, Florida, Missouri, Kansas, Arizona, Colorado, Alaska; on every other continent.

Closterium acerosum var. **elongatum** Bréb.
Road to West Point, Mississippi; Auburn, Alabama.
United States: Massachusetts, Missouri; England, France, Germany, Switzerland, Ceylon, Mexico.

Closterium cornu Ehrenb.
Ocean Springs, Mississippi.
United States: Connecticut; widely distributed on the other continents.

Closterium costatum Corda.
Pond west of Woodberry, New York; Lake Ronkonkoma, Long Island, New York.
United States: Connecticut, Massachusetts, Maine, New Hampshire; Canada, British Isles, France, Germany, Austria, Hungary, Italy, Switzerland, Norway, Sweden, Denmark, North and South Russia, Faeroes, Carolien Islands (Pacific), Burma, Greenland.

Closterium cynthia DeNot.
Ocean Springs, Mississippi.
United States: Connecticut, New Hampshire, Massachusetts, North Carolina; Newfoundland and all the other continents.

Closterium decorum Bréb. **Pl. XI, fig. 14.**
Lake Ronkonkoma, Long Island, New York.
United States: Connecticut, Maine, New Hampshire, Massachusetts, Ohio, Michigan, Wisconsin; Europe, Ceylon, Sumatra, Java, Australia, New Zealand.

Closterium dianae Ehrenb.
Pascagoula, Mississippi.
United States: Connecticut, Maine, New Hampshire, Massachusetts, Rhode Island, New York, Georgia, Florida, North Carolina, Ohio, Michigan, Indiana, North Dakota; widely distributed in other parts of the world.

Closterium didymotocum Corda.

Cold Spring Harbor, New York.

United States: Connecticut, New Hampshire, Maine, Massachusetts, Rhode Island, Michigan, Illinois, Kansas; Europe, Faeroes, India, Singapore, East Africa, Colombia.

Closterium ehrenbergii Menegh. **Pl. XI, fig. 8.**

Cold Spring Harbor, New York.

Cosmopolitan.

Closterium gracile Bréb.

Auburn, Alabama.

United States: Maine, Massachusetts, Rhode Island, Connecticut, North Carolina, Wisconsin, Arizona; from every other continent.

***Closterium intermedium** var. **hibernicum** West. **Pl. XI, fig. 16.**

Lake Ronkonkoma, Long Island, New York.

Great Britain.

Closterium juncidum var. **elongatum** (Ralfs) Roy and Biss.

Belmont pond near Babylon, New York.

United States: Massachusetts; Scotland.

Closterium kutzingii Bréb. **Pl. XI, fig. 15.**

Ocean Springs, Mississippi.

United States: Connecticut, New Hampshire, Ohio, Michigan, Minnesota; reported from all other continents.

Closterium lanceolatum Kutz.

Cocoa, Florida; artesian well, Durant, Mississippi.

United States: Connecticut, Rhode Island, Vermont, Massachusetts, Ohio, Indiana, Kansas, North Dakota; Europe, Greenland, China, Turkestan, South Tibet, Central, East and Southwest Africa, Madagascar, Patagonia, West Indies.

Closterium leibleinii Kutz. **Pl. XI, fig. 11.**

City Park, New Orleans, Louisiana; sphagnum bog, Woodberry, New York.

United States: Maine, Connecticut, Rhode Island, Massachusetts, Georgia, Pennsylvania, North Carolina, Ohio, Indiana, Illinois, Michigan, Kansas, North Dakota, Colorado; widely distributed on other continents.

Closterium lineatum Ehrenb.

Swamp south of Starkville, Mississippi; Auburn, Alabama; St. James Pond, Cold Spring Harbor, New York.

United States: Maine, Massachusetts, Rhode Island, Connecticut, New York, Pennsylvania, Michigan, Ohio, North Carolina, Kansas; now recorded from all other continents.

Closterium macilentum Bréb.

Jackson, Mississippi.

United States: New Hampshire, Connecticut, Massachusetts, New York, Michigan, Kansas, Minnesota; British Isles, France, Austria, North Germany, Latvia, Switzerland, Norway, Faeroes, India, Japan, Brazil.

Closterium moniliferum (Bory) Ehrenb.

Baton Rouge, Louisiana; swamp south of Starkville, Mississippi; Auburn, Alabama; Cold Spring Harbor, New York.

United States: Connecticut, New Hampshire, Maine, Massachusetts, Rhode Island, Georgia, North Carolina, Ohio, Indiana, Illinois, Missouri, Wisconsin, Colorado; Europe, China, Japan, Siberia, Central and South Africa, India, Ceylon, New Zealand, West Indies, New Caledonia, Brazil, Argentina, Colombia, Uruguay, Patagonia.

Closterium parvulum Nag.

Baton Rouge, Louisiana; sphagnum bog, Woodberry, New York.

United States: Maine, New Hampshire, Massachusetts, Connecticut, Pennsylvania, Ohio, Illinois, Colorado, Minnesota, Alaska; all other continents.

Closterium regulare Bréb.

Birmingham, Alabama.

United States: New Hampshire, Massachusetts, Connecticut, Rhode Island; now recorded from every continent.

Closterium rostratum Ehrenb.

Cold Spring Harbor, New York.

United States: Maine, Massachusetts, Connecticut, North Carolina, Michigan, Kansas; recorded from all the continents but Australia.

***Closterium siliqua** W. and G. S. West.

Starkville, Mississippi.

England, Siberia, Latvia.

Closterium striolatum Ehrenb.

Auburn, Alabama; Fishing Club, Smithtown, New York.

United States: Maine, New Hampshire, Massachusetts, Connecticut, Pennsylvania, Michigan, Florida, Colorado, Arizona, Oregon, Alaska; recorded from every continent.

Closterium toxon West.

Ocean Springs, Mississippi.

United States: Connecticut, Florida; British Isles, North Germany, Latvia, Newfoundland, Singapore.

***Closterium turgidum** var. **giganteum** (Ehrenb.) Nordst.

Length, 869μ, breadth 100μ, breadth of apice 18.5μ. Baton Rouge, Louisiana.

The form reported by Nordst from Brazil was over 1,300μ in length. This specimen was larger than the dimensions of *Cl. turgidum* so was listed as the variety.

South America: Brazil, Paraguay.

Closterium ulna Focke.

Mobile, Alabama.

United States: Connecticut, Massachusetts; Great Britain, France, Austria, Germany, Switzerland, Latvia, Norway, Finland, Denmark, Russia, Poland, Greenland, India, Colombia.

Pleurotaenium coronatum (Bréb.) Rabenh.

Caldwell's Pond, Amory, Mississippi.

United States: Maine, New Hampshire, Connecticut, Massachusetts, Ohio, Michigan, Illinois; Newfoundland, Europe, Central and East Africa, Greenland, Brazil.

Pleurotaenium coronatum var. **fluctuatum** West.

Lake Ronkonkoma, Long Island, New York.

United States: New Hampshire, Massachusetts, Connecticut, Illinois; Ireland, Scotland.

Pleurotaenium coronatum var. **nodulosum** (Bréb) West.

Baton Rouge, Louisiana; Belmont Pond, Babylon, New York; Lake Ronkonkoma, Long Island, New York.

United States: Massachusetts, Rhode Island, Ohio; recorded from all continents but Australia.

Pleurotaenium ehrenbergii (Bréb.) DeBary. **Pl. XI, fig.4.**

Auburn, Alabama; Starkville, Mississippi; Durant, Mississippi; in cold water stream, Fourth Lake, Cold Spring Harbor, New York.

United States: Massachusetts, New York, Michigan, Illinois, Wisconsin, Arizona; Newfoundland, Ontario, Canada; all other continents.

Pleurotaenium ehrenbergii var. **elongatum** West.

Baton Rouge, Louisiana.

United States: New Hampshire, Massachusetts, Michigan, Wisconsin; Ireland, Wales.

Pleurotaenium maximum (Reinsch) Lund.

Auburn, Alabama; one specimen was 930μ long, 39μ broad, Castalian Lake, Durant, Mississippi; another was 1,120μ long, 64μ broad, Cold Spring Harbor, New York.

United States: Maine, Massachusetts, Ohio; Ontario, Canada; Europe, Ceylon, Malay, Siam, Brazil, Colombia, New Caledonia.

Pleurotaenium maximum var. **tumidum** nov. var. **Pl. XI, fig. 1.**

Undulations throughout the cell, the cell wall may or may not be granulate. Length 750-950μ, breadth at base of semicell 65μ, largest breadth 70μ. Cold spring Harbor, New York.

Pleurotaenium nodosum (Bailey) Lund. **Pl. XI, fig. 17.**

Mobile, Alabama; occurred in long filaments, from 3-16 cells in some cases, joined end to end, Lake Ronkonkoma, Long Island, New York.

United States: Maine, New Hampshire, Massachusetts, Connecticut, Rhode Island, Florida, Michigan, Wisconsin, Alaska; Europe, Asia, Java, New Zealand, Brazil, Colombia, Paraguay.

***Pleurotaenium subcornulatum** (Turner) W. and G. S. West.

Cold Spring Harbor, New York.

United States: Wisconsin; Madagascar.

Pleurotaenium subcornulatum var. **detum** W. and G. S. West. **Pl. XI, fig. 2.**

In filaments, usually four or five joined end to end, semicells with only one undulation, Cold Spring Harbor, New York.

United States: New York, Wisconsin; Colombia.

Pleurotaenium trabecula (Ehrenb.) Nag.

Jackson, Mississippi; Durant, Mississippi; Starkville, Mississippi; Pascagoula, Mississippi; Baton Rouge, Louisiana.

United States: Maine, New Hampshire, Massachusetts, Connecticut, South Carolina, Georgia, Florida, Pennsylvania, Michigan, Ohio, Illinois, Minnesota, Missouri, Kansas, Colorado; recorded from all other continents.

Pleurotaenium trabecula forma **clavata** (Kutz.) W. and G. S. West.

Castalian Lake, Durant, Mississippi.

United States: Massachusetts; British Isles, France, Germany, Italy, Sweden, Switzerland, India.

Pleurotaenium trabecula forma **granulata** G. S. West.

Royal Palm Park, Florida.

United States: New Hampshire, Missouri; England, Norway.

Pleurotaenium trochiscum W. and G. S. West. **Pl. XIV, fig. 8.**

Cold Spring Harbor, New York.

Identified as a new species by West in paper of North American Desmidieae (1896).

Triploceros gracile Bailey. **Pl. XI, fig. 7.**

Ocean Springs, Mississippi; Marcus Creek, Pensacola, Florida; Belmont Pond, Babylon, New York.

United States: New Hampshire, Massachusetts, Rhode Island, Connecticut, New Jersey, Georgia, Florida, Wisconsin, Minnesota; Ontario, Canada; Cuba, New Zealand, Australia, India, China, Burma, Java, Brazil.

Triploceros verticillatum Bailey.

Ocean Springs, Mississippi; Mobile, Alabama; Belmont Pond, Babylon, New York.

United States: New Hampshire, Rhode Island, Massachusetts, New Jersey, Connecticut, Florida, Georgia, Wisconsin; Cuba, Brazil.

Tetmemorus brebissonii (Menegh.) Ralfs. **Pl. XI, fig. 10.**

Cold Spring Harbor, New York.

Cosmopolitan.

Tetmemorus granulatus var. **attenuatus** (Ralfs.) West.

Ocean Springs, Mississippi.

United States, British Isles, North Germany, Norway, Sweden.

Tetmemorus laevis (Kutz.) Ralfs. **Pl. XI, fig. 9.**

Side hill spring swamp, Cold Spring Harbor, New York.

United States: Maine, Massachusetts, Connecticut, Pennsylvania, Ohio, Colorado, Alaska; world-wide in its distribution.

Euastrum affine Ralfs. **Pl. XIII, figs. 51-52.**

Ocean Springs, Mississippi.

United States: Connecticut, Massachusetts, South Carolina, Georgia, Alaska; British Isles, France, Germany, Switzerland, Norway, Sweden, Denmark, Russia, Latvia, India.

Euastrum ansatum Ralfs. **Pl. XIII, fig. 54.**

Castalian Lake, Durant, Mississippi; found specimens with smooth cell wall and same as West's description that had a length of 149μ, breadth 77μ, breadth of isthmus 22μ, Auburn, Alabama.

United States: Maine, New Hampshire, Massachusetts, Connecticut, Rhode Island, Michigan, Indiana, Colorado, Alaska; world-wide in distribution.

Euastrum bidentatum Nag. **Pl. XIII, fig. 56.**

Castalian Lake, Durant, Mississippi.

United States: Connecticut, Michigan, Colorado; British Isles, France, Germany, Switzerland, Norway, Sweden, Denmark, Iceland, Bornholm, Greenland, Latvia, Russia, Brazil.

***Euastrum binale** forma **hians** (Turp.) West.

Pascagoula, Mississippi.

England, Ireland, Germany, Norway, Ceylon.

Euastrum denticulatum (Kirchn.) Gay.

Miller's Pond, Smithtown, New York.

United States: Michigan, New Hampshire; reported from every continent.

Euastrum didelta (Turp.) Ralfs. **Pl. XIII, fig. 50.**

Lake Ronkonkoma, Long Island, New York; Gainesville, Florida.

United States: Maine, Connecticut, Rhode Island, Massachusetts, New Hampshire, Pennsylvania, South Carolina, Georgia, Michigan, Indiana, Wisconsin, Colorado, Alaska; Ontario, Canada; Europe, Asia, India, Ceylon, Azores, Australia.

***Euastrum dubium** Nag.

Castalian Lake, Durant, Mississippi; side hill spring swamp, Cold Spring Harbor, New York.

British Isles, France, Germany, Norway, Sweden, Denmark, Switzerland, Latvia, Siberia, Italy, Greenland.

***Euastrum dubium** var. **cambrense** (Turner) West.

Castalian Lake, Durant, Mississippi.

Wales.

Euastrum elegans (Bréb.) Kutz.

Mobile, Alabama.

United States: Massachusetts, New Hampshire, Rhode Island, Connecticut, Ohio, North Carolina, South Carolina, Georgia, Florida, Vermont, Wisconsin, Alaska; recorded from every continent but Australia.

Euastrum elegans var. **pseudoelegans** (Turner) W. and G. S. West.

Cocoa, Florida; Cold Spring Harbor, New York.

United States, Wales.

***Euastrum elegans** var. **Novae Semiliae** Wille.

Royal Palm Park, Florida.

Ireland, Scotland, Nova Zembla.

Euastrum evolutum var. **integrius** W. and G. S. West. **Pl. XIII, fig. 57.**

Cold Spring Harbor, New York.

Identified by Wests in (1896).

Euastrum gemmatum Bréb. **Pl. XIII, fig. 55.**

Auburn, Alabama; Castalian Lake, Durant, Mississippi.

United States: New Hampshire, Massachusetts, Rhode Island, Connecticut, Michigan, Wisconsin, Washington, Alaska; British Isles, France, Belgium, Germany, Switzerland, Norway, Sweden, Denmark, Latvia, Bornholm, Poland, South Russia, Faeroes, Greenland, India, West Indies, Brazil, Paraguay.

Euastrum oblongum (Grev.) Ralfs. **Pl. XIII, fig. 67.**

Bog south of Cold Spring Harbor, New York.

United States: Maine, Massachusetts, Rhode Island, Connecticut, North Carolina, Wisconsin, Alaska; Europe, Siberia, Faeroes, Greenland, Japan, Brazil.

Euastrum pictum Borge.

Lake Ronkonkoma, Long Island, New York.

United States: Connecticut; Norway, Brazil, Colombia.

Euastrum pinnatum Ralfs. **Pl. XIII, fig. 65.**

Starkville, Mississippi; Mobile, Alabama; bog south of Cold Spring Harbor, New York.

United States: Connecticut, Massachusetts, New Hampshire, New York, Florida, Michigan, Wisconsin, North Carolina; Newfoundland, British Isles, France, Germany, Latvia, Austria, Norway, Sweden, Finland, Faeroes, Colombia.

Euastrum pulchellum Bréb.

Two specimens were somewhat larger than the dimensions of West but with the same shape and markings, length 50μ, breadth 40.7μ, isthmus 6.8μ, Castalian Lake, Durant, Mississippi.

United States: Connecticut, Wisconsin, New York, Illinois; Ontario, Canada; British Isles, France, Norway, Sweden, Finland, North Germany, Switzerland.

Euastrum rostratum Ralfs.

High Hill, Long Island, New York.

United States, Europe, Faeroes, Spitzbergen, Greenland, India, Ceylon, Burma (Var.), Australia (Var.), New Zealand (Var.), Madagascar (Var.).

Euastrum sinuosum Lenorm.

Ocean Springs, Mississippi.

United States: Connecticut, Florida; Europe, Faeroes, India, Siam, Burma, Singapore, Java, Australia, Central Africa, New Zealand, Sandwich Islands, Caroline Islands, Guiana, Brazil.

Euastrum sinuosum var. **reductum** W. and G. S. West.

Pond west of Woodberry, New York.

United States: Connecticut; British Isles, Norway, Switzerland, Singapore, West Africa.

Euastrum sublobatum Bréb.

Baton Rouge, Louisiana.

United States, France, Switzerland, Germany, Austria, Hungary, Italy, Norway, Poland, South Russia, Greenland, New Zealand, West Indies, Paraguay.

*Euastrum turnerii West.

Lake Ronkonkoma, Long Island, New York.
British Isles, North Germany, Finland, Australia, Columbia.

Euastrum verrucosum Ehrenb. Pl. XIII, figs. 58-59.

Lake Ronkonkoma, Long Island, New York.
Cosmopolitan.

Euastrum verrucosum var. alatum (Ehrenb.) Wolle. Pl. XIII, fig. 34.

Durant, Mississippi; Cold Spring Harbor, New York.
United States: Maine, Massachusetts, North Carolina, Louisiana; Ontario, Canada; Scotland, Ireland, Austria, North Germany, Latvia, Norway, Sweden, Switzerland, North Russia, Greenland, Finland.

*Euastrum verrucosum var. coarctatum (Ehrenb.) Delp. Pl. XIII, fig. 33.

Ocean Springs, Mississippi; side hill spring swamp, Cold Spring Harbor, New York.
Ireland, Norway, Austria, Poland, Italy.

*Euastrum verrucosum var. planctonicum W. and G. S. West.

Cold Spring Harbor, New York.
Scotland.

Euastrum verrucosum var. reductum (Ehrenb.) Nordst.

Baton Rouge, Louisiana; Lake Ronkonkoma, Long Island, New York.
United States: Maine, North Carolina, Colorado; Ontario, Canada; Scotland, Ireland, Norway, Sweden, North Russia, Uruguay, Argentine.

Euastrum wollei Lag. Pl. XIII, figs. 31-32.

Cells large, more than one and one-half times as long as broad; deeply constricted, sinus very open; semicells two-lobed, the interlobular incision deep but open; polar lobe widely cuneate with two prominent protuberances, angles rounded and granulate, apical incision not so prominent and closed; lateral lobes wider than polar lobe, slightly rounded and granulate with three large protuberances across the broadest part, each protuberance furnished with large wart-like granules arranged in concentric circles; cell wall granulate, very evident especially at the angles. Length of cell 172μ, breadth 108-112μ, breadth between polar and lateral lobes 38μ, thickness 72μ, breadth of isthmus 24μ. Found at Mobile, Alabama; abundant in the one collection in which it was found.

Without doubt, the specimens found in my collections are the same as the one originally called *E. intermedium* by Wolle but changed to *E. wollei* by Lagerheim in his paper of 1886. In some respects the specimen resembles the figure which Wolle describes as the var. *cuspidatum* but the dimensions and exact description were not given.

Micrasterias americana (Ehrenb.) Ralfs.

Baton Rouge, Louisiana; Cold Spring Harbor, New York.
United States: Maine, New Hampshire, Massachusetts, Connecticut, Rhode Island,

North Carolina, South Carolina, Florida, Michigan, Ohio, Illinois, Missouri; Montreal, Canada; Europe, Greenland, North India, East Africa, Brazil, Colombia.

Micrasterias apiculata (Ehrenb.) Menegh.

Baton Rouge, Louisiana.

United States: Maine, New Hampshire, Massachusetts, Connecticut, New York, Florida, Michigan, Wisconsin; Europe, Japan, India, Burma, Brazil.

Micrasterias apiculata var. **fimbriata** (Ralfs) Nordst.

Mobile, Alabama.

United States: Maine, Massachusetts, New Hampshire, Connecticut, New York, Wisconsin; Ontario, Canada; British Isles, France, Belgium, Germany, Austria, Switzerland, Norway, Sweden, Denmark, North and South Russia, Latvia.

Micrasterias arcuata Bailey.

Mobile, Alabama.

United States: Florida, Massachusetts; Newfoundland, Cuba, West Africa.

Micrasterias arcuata var. **gracilis** (Bail.) W. and G. S. West. **Pl. XII, fig. 22.**

Mobile, Alabama.

United States: Pennsylvania, Florida.

Micrasterias conferta var. **hamata** (Lund.) Wolle.

Gainesville, Florida.

United States: Wisconsin; Scotland.

Micrasterias crenata Bréb.

Cold Spring Harbor, New York.

United States: New Hampshire, Massachusetts, Connecticut, North Carolina; Europe, West Africa, Brazil.

Micrasterias crux-melitensis (Ehrenb.) Hass. **Pl. XII, fig. 26.**

St. James Pond, Cold Spring Harbor, New York.

United States: Maine, Massachusetts, Connecticut, Ohio, Michigan; Europe, Japan, India, Ceylon, Burma, Celebes, Central and East Africa, Brazil.

Micrasterias denticulata Bréb.

Auburn, Alabama.

United States: Maine, New Hampshire, Massachusetts, Connecticut, Rhode Island, Pennsylvania, Florida, North Carolina, Colorado, Alaska; now reported from every continent since Fritsch found it in South Africa.

Micrasterias denticulata var. **angulosa** (Hantzsch) W. and G. S. West.

Marcus Creek, Pensacola, Florida.

United States: New Hampshire, Massachusetts, Michigan; Ontario, Canada; Europe, Bornholm, Greenland, Newfoundland, New Zealand, Brazil.

Micrasterias foliaceae Bail. **Pl. XII, fig. 19.**

Auburn, Alabama; Belmont Pond, Babylon, New York.

United States: New Hampshire, Massachusetts, Rhode Island, New York, Wisconsin; Brazil, Bengal, Lower Burma, Siam, India, Ceylon, Java, Australia.

Micrasterias furcata Ralfs.

Fishing Club, Smithtown, New York.

United States: Maine, New Hampshire, Rhode Island, New Jersey, New York, South Carolina, North Carolina, Georgia, Florida, Kansas, Washington; Brazil, Paraguay, Europe.

Micrasterias laticeps Nordst. **Pl. XII, fig. 20.**

Cold Spring Harbor, New York; Wisconsin.

United States: Wisconsin; Europe.

Micrasterias mahabuleshwarensis Hobson. **Pl. XII, fig. 27.**

Lake Ronkonkoma, Long Island, New York.

United States: New Hampshire, Massachusetts, Connecticut, New York; Europe, East Africa, India, Siam, Burma, Java, New Zealand, Australia, Brazil, Colombia, British Guiana.

Micrasterias muricata (Bail.) Ralfs.

Lake Ronkonkoma, Long Island, New York.

United States: Maine, New Hampshire, Massachusetts, Connecticut, Rhode Island, New York, Wisconsin; Ontario, Canada.

Micrasterias oscitans var. **mucronata** (Dixon) Wille.

Ditch near Fourth Lake, Cold Spring Harbor, New York.

United States: Michigan; British Isles, France, North Germany, Norway, Faeroes, India.

Micrasterias papillifera Bréb.

Fishing Club, Smithtown, New York.

United States: Maine, New Hampshire, Massachusetts, Rhode Island, Connecticut, Florida, Michigan, Indiana; Europe, Greenland, New Zealand, Brazil.

Micrasterias pinnatifida (Kutz.) Ralfs. **Pl. XII, figs. 24-25.**

Castalian Lake, Durant, Mississippi; Lake Ronkonkoma, Long Island, New York.

United States: Maine, New Hampshire, Massachusetts, Rhode Island, Connecticut, Michigan, Wisconsin, Washington; Ontario, Newfoundland, Europe, Faeroes, India, Burma, Ceylon, West Indies, Central Africa (Var.), Brazil.

Micrasterias radiata Hass. **Pl. XI, fig. 30.**

Cold Spring Harbor, New York.

Cosmopolitan.

Micrasterias rotata (Grev.) Ralfs.

Lake Ronkonkoma, Long Island, New York; side hill spring swamp, Cold Spring Harbor, New York.

United States: Maine, New Hampshire, Massachusetts, Connecticut, Rhode Island, Kansas, Colorado, Michigan, North Carolina, Alaska; Europe, Japan, India, Siam, Singapore, Madagascar, Brazil, Colombia.

Micrasterias sol (Ehrenb.) Kutz. **Pl. XII, fig. 6.**

Baton Rouge, Louisiana; Birmingham, Alabama; Auburn, Alabama; Castalian Lake. Durant, Mississippi; Starkville, Mississippi; bog south of Cold Spring Harbor, New York.

United States: New Hampshire, Massachusetts, Connecticut, Rhode Island, Ohio; Ontario, Canada; British Isles, France, Italy, Norway, Sweden, Denmark, Latvia, Jamaica, Brazil.

Micrasterias sol var. **ornata** Nordst. **Pl. XII, fig. 21.**

High Hill, Long Island, New York.

United States: Massachusetts; Ontario, Canada; Wales, Scotland, Norway, Sweden, Brazil, Colombia.

Micrasterias truncata (Corda) Bréb. **Pl. XII, figs. 18, 28-29.**

Auburn, Alabama; Mobile, Alabama; Lake Ronkonkoma, Long Island, New York; bog south of Cold Spring Harbor, New York.

United States: Maine, New Hampshire, Massachusetts, Connecticut, Rhode Island, Georgia, Florida, Pennsylvania, Michigan, Ohio, Indiana, Illinois, Wisconsin, Kansas, Minnesota, Alaska; Newfoundland, Cuba, Europe, Siberia, Faeroes, North India, Sandwich Islands, Madagascar, Brazil, Bolivia.

Micrasterias truncata var. **major** nov. var.

So much larger than the dimensions given by West, otherwise in agreement with the description and figure. Length 210μ, breadth 185μ, breadth of isthmus 37.4μ. Side hill spring swamp, Cold Spring Harbor, New York.

***Micrasterias truncata** var. **granulata** Racib.

Larger than the dimensions by West. Bog south of Cold Spring Harbor, New York.

England, Ireland, Austria.

***Cosmarium abbreviatum** var. **planctonicum** W. and G. S. West.

Auburn, Alabama.

British Isles, Norway, Sweden, North Germany, Portugal.

***Cosmarium alpestre** Roy and Biss. **Pl. XIII, fig. 36.**

Lake Ronkonkoma, Long Island, New York.

Scotland.

Cosmarium anceps Lund.

According to West this is a very characteristic alpine and subalpine species. Side hill spring swamp, Cold Spring Harbor, New York.

United States, Europe, Faeroes, Nova Zembla, Spitzbergen, Greenland.

Cosmarium angulosum Bréb.

Baton Rouge, Louisiana.

Cosmopolitan.

***Cosmarium bipunctatum** Borge.

Auburn, Alabama.

British Isles, Brazil.

Cosmarium blytii Wille.

Auburn, Alabama.

United States: Maine; Europe, West, Central and East Africa, Madagascar, Ceylon, Central China, New Zealand, Australia, Brazil, Colombia.

Cosmarium botrytis Menegh.

Smithtown, New York.

United States: Massachusetts, Connecticut, North Carolina, Pennsylvania, Michigan, Ohio, Illinois, Wisconsin, Missouri, Kansas, Colorado, Alaska; Montreal, Canada; all other continents.

***Cosmarium botrytis** var. **subtumidum** Wittr.

Natchez, Mississippi.

Germany, Galicia in Austria, Norway, Sweden, North Russia, Greenland, Siberia.

Cosmarium connatum Bréb.

Mobile, Alabama.

United States: Massachusetts, New Hampshire, Rhode Island, Florida; Newfoundland, Europe, Japan, India, Burma, Siberia, Singapore, Java, Central Africa, Sandwich Islands, Greenland, British Guiana, Brazil.

Cosmarium conspersum var. **latum** (Bréb.) W. and G. S. West.

Auburn, Alabama.

United States, Europe, Siberia, Greenland, China, Celebes, Patagonia, Brazil.

***Cosmarium contractum** var. **ellipsoideum** (Elfv.) W. and G. S. West.

Ocean Springs, Mississippi.

Europe: British Isles, Sweden, Norway, North Germany, Latvia, Finland, Iceland, Australia, Newfoundland.

Cosmarium costatum Nordst.

Montvale, Tennessee.

West considers this a rare alpine and arctic Desmid which exhibits considerable variation in size.

United States: North Carolina; Northern Europe, Greenland, Spitzbergen.

Cosmarium cucumis (Corda) Ralfs.

Sphagnum bog northwest of Woodberry, New York.

United States: North Carolina, South Carolina, Georgia, Florida, Connecticut, Massachusetts, Pennsylvania, Indiana; Newfoundland, Greenland, Spitzbergen, Nova Zembla, Siberia, Iceland, Faeroes, Azores, Burma, Porto Rico, Brazil, Uruguay, Patagonia, Europe.

Cosmarium cucurbita Bréb.

Auburn, Alabama.

United States: Connecticut; Europe, Faeroes, Greenland, Singapore, Australia, West Africa, West Indies, Brazil, New Caledonia.

Cosmarium formosulum Hoff. **Pl. XIII, fig. 49.**

Cold Spring Harbor, New York.

United States: Illinois, North Dakota, Colorado, Arizona; Europe, Bornholm, Faeroes, Iceland, Siberia, West Indies, Southwest Africa.

Cosmarium formosulum var. **nathorstii** (Boldt) W. and G. S. West.

City Park, New Orleans, Louisiana.

United States: North Dakota; England, Austria, Latvia, Norway, Faeroes, Greenland.

Cosmarium isthmium West. **Pl. XIII, fig. 47.**
Sphagnum bog, northwest of Woodberry, New York.
United States, British Isles.

***Cosmarium isthmium** var. **hibernica** West.
Auburn, Alabama; Baton Rouge, Louisiana.
Found only in Ireland.

***Cosmarium logiense** Bissett. **Pl. XIII, fig. 35.**
Amory, Mississippi; Miller's Pond, Smithtown, New York.
England, Austria, Norway, West Indies, Southwest Africa.

Cosmarium margaritatum (Lund.) Roy and Biss.
Amory, Mississippi.
United States: Maine, New Hampshire, Connecticut; British Isles, France, Germany, Austria, Latvia, Norway, Sweden, North Finmark, Greenland, Siberia, India, Ceylon, Singapore, West and Central Africa, West Indies, Brazil.

***Cosmarium margaritatum** forma **subrotundata** W. and G. S. West. **Pl. XIII, fig. 42.**
Lake Ronkonkoma, Long Island, New York.
Recorded only from Wales and Scotland.

Cosmarium meneghinii Bréb.
Royal Palm Park, Florida.
United States: Massachusetts, Connecticut, Georgia, Pennsylvania, Ohio, North Dakota, Nebraska; cosmopolitan.

Cosmarium microsphinctum Nordst.
Pascagoula, Mississippi.
United States, Europe, Greenland, Nova Zembla, Franz Josef Land.

***Cosmarium ochthodes** var. **amoebum** West. **Pl. XIII, fig. 46.**
Terry, Mississippi.
British Isles, Austria, Switzerland, Latvia, Lapland, Spitzbergen.

Cosmarium orbiculatum forma **major** (Ralfs) W. and G. S. West.
Mobile, Alabama.
Found only in Wales.

Cosmarium ornatum Ralfs.
Mobile, Alabama.
United States: Massachusetts, New Hampshire, Connecticut, Wisconsin, Kansas, Alaska; Ontario, Canada; Europe, Iceland, Brazil, Paraguay.

Cosmarium orthogonum Delp.
Mobile, Alabama.
United States, Scotland, Italy, Austria.

Cosmarium orthostichum var. **pumilum** Lund.
Baton Rouge, Louisiana.

United States: Colorado; British Isles, Galicia in Austria, North Germany, Switzerland, Norway, Sweden.

Cosmarium ovale Ralfs. **Pl. XIII, fig. 41.**

Baton Rouge, Louisiana; Lake Ronkonkoma, Long Island, New York; Miller's Pond, Smithtown, New York.

United States: Connecticut, Rhode Island, New York, Pennsylvania, North Carolina, South Carolina, Wisconsin; British Isles, France, Galicia, Switzerland, North Germany, Italy, Scandanavia, Finland, Brazil.

Cosmarium ovale var. **subglabrum** W. and G. S. West.

Bog south of Cold Spring Harbor, New York.

United States, England.

***Cosmarium pachydermum** var. **aethiopicum** W. and G. S. West.

Lake Ronkonkoma, Long Island, New York.

Norway, Latvia, India, West Africa.

***Cosmarium plicatum** var. **major** Reinsch. **Pl. XIII, fig. 45.**

Royal Palm Park, Florida.

Scotland, Germany.

Cosmarium portianum Archer. **Pl. XIII, fig. 37.**

Aberdeen, Mississippi; Castalian Lake, Durant, Mississippi; Auburn, Alabama; Cold Spring Harbor, New York.

United States: Maine, Connecticut, North Carolina, Michigan, Illinois, Kansas, Wisconsin; Europe, Spitzbergen, Nova Zembla, Siberia, Central China, India, Burma, Ceylon, Australia, Japan, Azores, Brazil.

Cosmarium pseudomoenum Wille. **Pl. XIII, fig. 40.**

Auburn, Alabama.

United States, Europe, Central China, New Zealand, East Africa, Madagascar, Brazil, Colombia.

***Cosmarium pseudoconnatum** var. **ellipsoideum** W. and G. S. West.

Castalian Lake, Durant, Mississippi.

Known only to occur in Indo-Malayan region.

Cosmarium pseudonitidulum Nordst.

Gainesville, Florida.

United States: Maine; Newfoundland, Norway, France, Pyrenees Mountains, Poland, Siam, Central China, Turkestan, Colombia.

Cosmarium pseudonitidulum var. **validum** W. and G. S. West. **Pl. XIII, fig. 39.**

Mobile, Alabama.

United States: Connecticut; British Isles, Norway, India, Azores, West and South Africa.

Cosmarium pseudoprotuberans Kirchn.

Castalian Lake, Durant, Mississippi.

United States: Maine, Michigan; cosmopolitan.

Cosmarium pseudopyramidatum Lund.

Mobile, Alabama.

United States: Maine, New Hampshire, Massachusetts, Connecticut, Ohio; widely distributed.

Cosmarium pseudopyramidatum var. **stenonotum** Nordst.

Cocoa, Florida.

United States: Maine; Europe, Bornholm, Japan, Australia, West Indies, Paraguay.

***Cosmarium punctulatum** var. **rotundatum** (Bréb.) Klebs.

Auburn, Alabama.

Wales, India.

Cosmarium punctulatum var. **subpunctulatum** (Nordst.) Borge. **Pl. XIII, fig. 48.**

Auburn, Alabama; Lake Ronkonkoma, Long Island, New York.

United States: Wisconsin; British Isles, Germany, Austria, Switzerland, Norway, Sweden, Latvia, Bornholm, Bosnia, Faeroes, Siberia, New Zealand, South Africa, Brazil, Patagonia.

Cosmarium pyramidatum Bréb. **Pl. XIII, fig. 44.**

Pascagoula, Mississippi; Cold Spring Harbor, New York.

United States: New Hampshire, Massachusetts, Connecticut, North Carolina, Georgia, Florida, Pennsylvania, Alaska; cosmopolitan.

Cosmarium rectangulare Grun.

Sphagnum bog, Woodberry, New York.

United States: New Hampshire, Kansas; Europe, Bornholm, Greenland, Siberia, Japan, Central and South Africa, West Indies.

Cosmarium reniforme (Ralfs) Archer.

Aberdeen, Mississippi; City Park, New Orleans, Louisiana; side hill spring swamp, Cold Spring Harbor, New York.

United States: New Hampshire, Massachusetts, Illinois, Michigan, Ohio, Wisconsin; Europe, Faeroes, Greenland, Spitzbergen, Australia, Turkestan, Caucasus, Siberia, Brazil, Argentina.

Cosmarium reniforme var. **compressum** Nordst.

Montvale, Tennessee.

United States: New Hampshire; British Isles, Norway, Latvia, India, New Zealand, Australia, British Guiana.

Cosmarium sexangulare Lund. **Pl. XIII, fig. 43.**

Cold Spring Harbor, New York.

United States, Europe, Japan, Australia, East Africa.

***Cosmarium simii** Roy and Biss.

Auburn, Alabama.

Found previously only in Scotland.

***Cosmarium subarctoum** (Lagerh.) Racib.

Cocoa, Florida.

British Isles, Sweden, North Russia, Norway, Greenland, Australia, Argentina.

Cosmarium subcucumis Schmidle.

Auburn, Alabama.

United States: Connecticut; England, France, Germany, Switzerland, Austria, and Galicia, Portugal, Norway, Sweden.

Cosmarium subtumidum Nordst.

Montvale, Tennessee.

United States: Connecticut; Europe, Greenland, Asia, Java, Australia, Africa, West Indies, Brazil.

Cosmarium taxichondrum Lund.

Cold Spring Harbor, New York.

United States: Massachusetts, New Hampshire, Michigan; Europe, Siberia, China, Japan, India, Ceylon, Java, Madagascar, Abyssinia, Central Africa.

Cosmarium tetraophthalmum Bréb.

Castalian Lake, Durant, Mississippi.

United States: Massachusetts, Connecticut, New Jersey, Ohio, Colorado; widely distributed but not reported from Africa.

Cosmarium thwaitesii Ralfs.

Cold Spring Harbor, New York.

United States: New Hampshire, Connecticut, Florida; Europe, New Zealand, Abyssinia.

***Cosmarium trachypleurum** var. **minus** Racib. **Pl. XIII, fig. 38.**

Mobile, Alabama.

Ireland, Scotland, Austria, Galicia, North Germany, Poland, North Russia, Switzerland, Sweden, Australia.

Cosmarium tumens Nordst.

Side hill spring swamp, Cold Spring Harbor, New York.

United States: Pennsylvania; Germany, England, Switzerland, Austria, Spitzbergen, China.

***Cosmarium viride** var. **glabra** (Josh.) W. and G. S. West.

Bog south Cold Spring Harbor, New York.

Scotland, Germany.

Xanthidium aculeatum Ehrenb.

Lake Joanna, Mt. Dora, Florida.

United States, Europe, Faeroes.

Xanthidium antilopaeum (Bréb.) Kutz. **Pl. XIII, fig. 66.**

Castalian Lake, Durant, Mississippi.

United States: New Hampshire, Massachusetts, Connecticut, Ohio, Michigan, Wisconsin, Kansas; Newfoundland, Europe, Faeroes, Siberia, Mongolia, Japan, India, Java, Central Africa, West Indies, Brazil, Paraguay.

Xanthidium antilopaeum var. **depauperatum** W. and G. S. West.

Marcus Creek, Pensacola, Florida.

United States: Wisconsin; British Isles.

Xanthidium antilopaeum var. **hebridarum** W. and G. S. West.
Cold Spring Harbor, New York.
United States: Connecticut; Scotland, Ireland, Finland, Norway, Siberia.

Xanthidium armatum (Bréb.) Rabenh. **Pl. XIII, fig. 53.**
Sphagnum bog south of Woodberry, New York.
United States: Massachusetts, South Carolina, Florida, Pennsylvania, Indiana, Wisconsin; Newfoundland, Europe, Faeroes, North India, Burma, New Zealand, Cuba, Colombia.

Xanthidium controversum W. and G. S. West. **Pl. XIII, fig. 60.**
Miller's Pond, Smithtown, New York.
United States: New Hampshire; Norway, Colombia.

Xanthidium cristatum Bréb. **Pl. XIII, fig. 61.**
Castalian Lake, Durant, Mississippi.
United States: New Hampshire, Connecticut, New York, South Carolina, Georgia, Florida, Wisconsin, Colorado; Newfoundland, Europe, Greenland, North India, East Africa, Brazil.

Xanthidium cristatum var. **leiodermum** (Roy and Biss.) Turner.
Castalian Lake, Durant, Mississippi.
United States, England, India, Japan.

Xanthidium tetracentrotum Wolle. **Pl. XIII, fig. 62.**
Mobile, Alabama.
Found in the United States by Wolle and Cushman.

Arthrodesmus convergens Ehrenb. **Pl. XIII, fig. 63.**
Castalian Lake, Durant, Mississippi.
United States: New Hampshire, Connecticut, Massachusetts, Rhode Island, South Carolina, Georgia, Florida, Michigan, Ohio, Indiana, Wisconsin, Kansas, Washington; widely distributed.

Arthrodesmus incus (Bréb.) Hass.
Mobile, Alabama.
United States: Massachusetts, Connecticut, Rhode Island, Georgia, South Carolina, Florida, Wisconsin, Minnesota; widely distributed.

Arthrodesmus incus var. **validus** W. and G. S. West. **Pl. XIII, fig. 64.**
Lake Ronkonkoma, Long Island, New York.
United States, Scotland, Ireland, Ceylon, Brazil.

Arthrodesmus octocornis Ehrenb.
Fourth Lake, Cold Spring Harbor, New York.
United States: Connecticut, Massachusetts, New Hampshire, Rhode Island, Florida, Georgia; Europe, Faeroes, Iceland, Siberia, Greenland, Mongolia, Japan, Burma, Ceylon, Australia, Cuba, Brazil.

Staurastrum aculeatum (Ehrenb.) Menegh.
Castalian Lake, Durant, Mississippi.

United States: Maine; Europe, Nova Zembla, Greenland, Siberia, Japan, Burma, Australia, New Zealand, Patagonia, Antarctic.

Staurastrum anatinum Cooke and Wills. **Pl. XIV, fig. 91.**

Belmont Pond, Babylon, New York.

United States: Maine, Massachusetts, Wisconsin; Ontario, Canada; Norway, Sweden, Finland, Latvia, Denmark.

Staurastrum anatinum var. **longibrachiatum** W. and G. S. West.

Fishing Club, Smithtown, New York.

United States: Wisconsin; Ontario, Canada; Scotland, Latvia.

Staurastrum artiscon (Ehrenb.) Lund.

Starkville, Mississippi.

United States: Connecticut, New Hampshire, New York, North Carolina, Michigan, Indiana, Kansas, Wisconsin, Colorado, Alaska; Newfoundland, Ontario, British Isles, France, Belgium, Latvia, Finland, North Germany, Norway, Sweden, Greenland, Brazil.

***Staurastrum bifidum** (Ehrenb.) Bréb.

Castalian Lake, Durant, Mississippi.

Europe, Central China, Japan, India, Ceylon, Burma, Siam, Java.

Staurastrum brasiliense Nordst.

Mobile, Alabama.

United States: New Hampshire, Florida; Cuba, Norway, France, Burma, Abyssinia, Brazil, Paraguay.

Staurastrum brasiliense var. **lundellii** W. and G. S. West. **Pl. XIV, fig. 90.**

Mobile, Alabama.

United States: New York, Wisconsin; British Isles, Norway, Sweden, North Germany, Finland, Paraguay.

Staurastrum cerastes Lund. **Pl. XIV, figs. 76-77.**

Cocoa, Florida.

United States: New Hampshire, Connecticut, New York, Florida, Wisconsin; Ontario, Canada; British Isles, Norway, Sweden, Finland, Ceylon.

***Staurastrum conspicuum** W. and G. S. West.

Sphagnum bog, northwest of Woodberry, New York.

Found in Scotland.

Staurastrum coronulatum Wolle.

Shallow stream, Gainesville, Florida.

Found previously in De Land, Florida, by West.

***Staurastrum cornutum** Arch.

Auburn, Alabama.

Found only in Scotland, Ireland, Finland.

Staurastrum dejectum Bréb.
Mobile, Alabama.
United States: Connecticut, Georgia, Wisconsin, Indiana, Alaska; widely distributed.

Staurastrum gladiosum Turner. **Pl. XIV, figs. 84-85.**
Lake Ronkonkoma, Long Island, New York.
United States: Connecticut; England, Wales, Latvia, India.

Staurastrum grallatorium Nordst.
Baton Rouge, Louisiana.
United States: Wisconsin; Europe.

Staurastrum hirsutum (Ehrenb.) Bréb.
Auburn, Alabama.
United States: Maine, Massachusetts, Connecticut, Rhode Island, North Carolina, Florida, Ohio, Indiana, Minnesota; Europe, Spitzbergen, Greenland, Colombia.

***Staurastrum inconspicuum** var. **crassum** Gay. **Pl. XIII, fig. 87.**
Lake Ronkonkoma, Long Island, New York.
Found in Ireland, France, Latvia.

Staurastrum macrocerum Wolle.
Mobile, Alabama; Pascagoula, Mississippi.
United States: Massachusetts; Newfoundland, Norway.

Staurastrum megalonotum Nordst.
Cold Spring Harbor, New York.
United States: New Hampshire; England, Germany, Austria, Greenland, Spitzbergen.

Staurastrum natator West.
"This rare and beautiful Desmid is only found in bogs in the region of older paleozoic rocks." Mobile, Alabama.
United States: Wisconsin; British Isles, Scandinavia, Finland.

***Staurastrum oligacanthum** Bréb. **Pl. XIV, fig. 89.**
Cold Spring Harbor, New York.
France, Switzerland, Austria, Norway, Spitzbergen, Greenland.

***Staurastrum ophiura** var. **cambricum** (Lund.) W. **and G. S. West. Pl. XIV, fig. 82.**
Mobile, Alabama.
Reported previously from Wales.

***Staurastrum oxyacanthum** Archer. **Pl. XIV, fig. 86.**
Auburn, Alabama.
Europe, Faeroes, Greenland, Siberia, Mongolia, Patagonia.

Staurastrum pseudosebaldi Wille.
Aberdeen, Mississippi.
United States: Massachusetts; Ontario, Canada; Europe, Asia, New Zealand, Greenland, Brazil, Colombia.

Staurastrum punctulatum var. **pygmaeum** (Bréb.) W. and G. S. West.
Baton Rouge, Louisiana; Fishing Club, Smithtown, New York.
Cosmopolitan.

Staurastrum setigerum Cleve.
Lake Joanna, Mt. Dora, Florida.
United States: Connecticut, Wisconsin; Europe, Africa, Brazil, Paraguay.

Staurastrum tetracerum Ralfs.
Castalian Lake, Durant, Mississippi.
United States: Maine, Connecticut; cosmopolitan.

Staurastrum tohopekaligense Wolle. **Pl. XIV, fig. 83.**
Lake Ronkonkoma, Long Island, New York.
United States: New York, Wisconsin; Ontario, Canada.

Staurastrum vestitum Ralfs. **Pl. XIV, fig. 93.**
Mobile, Alabama.
United States: Maine, Connecticut, Indiana, Wisconsin; Ontario, Canada; Europe, Asia, Azores, South America.

***Staurastrum vestitum** var. **semivestitum** West. **Pl. XIV, fig. 88.**
Sphagnum bog, Woodberry, New York.
Found in England, Latavia.

Cosmocladium pulchellum Bréb. **Pl. XIV, fig. 74.**
Royal Palm Park, Florida.
United States: Michigan; Scotland, France, Germany.

Sphaerozosma pulchrum Bail.
Caldwell's Pond, Armory, Mississippi; Aberdeen, Mississippi; Lake Ronkonkoma, Long Island, New York.
United States, Brazil, British Guiana.

Sphaerozosma retangulare (Corda) Wolle.
Starkville, Mississippi; Amory, Mississippi; Cocoa, Florida; Raymond, Mississippi.
Found in New Jersey, U.S.A.

Spondylosium papillosum W. and G. S. West.
Sphagnum bog, Woodberry, New York.
United States: Connecticut, Ohio; British Isles, Germany, Australia, Madagascar, Africa.

Spondylosium planum (Wolle) W. and G. S. West. **Pl. XIV, fig. 73.**
Mobile, Alabama; Lake Ronkonkoma, Long Island, New York.
United States: Connecticut, Wisconsin; Ontario, Canada; British Isles, Norway, Finmark, Latvia, Alaska.

Spondylosium pulchrum (Bail.) Archer. **Pl. XIV, fig. 68.**
Cold Spring Harbor, New York.
United States, Wisconsin; Europe.

Spondylosium pygmaeum (Cooke) West.

St. James Pond, Cold Spring Harbor, New York.

United States: Connecticut; British Isles, Germany, Switzerland, Roumania, Norway, South Africa, Azores.

Hyalotheca dissilens (Sm.) Bréb. **Pl. XIV fig. 71.**

Found abundantly in all the collections examined. It is one of the most common of Desmids and has been reported from every continent.

United States: New Hampshire, Massachusetts, Rhode Island, Connecticut, North Carolina, South Carolina, Georgia, Florida, Pennsylvania, Michigan, Ohio, Indiana, Illinois, Wisconsin, Colorado, Kansas.

***Hyalotheca dissilens** var. **bidentula** Nordst.

Castalian Lake, Durant, Mississippi.

Europe, Asia, New Zealand, Spitzbergen, Greenland, Cuba, Brazil.

Hyalotheca dissilens var. **hians** Wolle.

Crystal Springs, Mississippi.

United States, British Isles, Norway, Russia, Ceylon, New Zealand, West Indies, Brazil.

Hyalotheca dissilens var. **minor** Delp.

Pond near Mayhew, Mississippi.

United States: New Hampshire; Wales.

Hyalotheca mucosa (Mert.) Ehrenb. **Pl. XIV, fig. 70.**

Lake Ronkonkoma, Long Island, New York.

United States: Maine, Massachusetts, Connecticut, Rhode Island, North Carolina, Georgia, Wisconsin; widely distributed.

Desmidium aptogonum Breb. **Pl. XIV, fig. 92.**

Pond southwest of Starkville, Mississippi; Terry, Mississippi; Cocoa, Florida; High Hill, New York.

United States: New Hampshire, Massachusetts, Connecticut, North Carolina, South Carolina, Georgia, Florida, Wisconsin; recorded from all continents but Africa.

Desmidium aptogonum var. **ehrenbergii** Kutz.

Lake Ronkonkoma, Long Island, New York.

United States, Europe.

Desmidium baileyii (Ralfs) Nordst. **Pl. XIV, fig. 80.**

Baton Rouge, Louisiana; Auburn, Alabama; Gainesville, Florida; Lake Ronkonkoma, Long Island, New York.

United States: New Hampshire, Massachusetts, Connecticut, Rhode Island, New York, Michigan, Minnesota, Wisconsin; Ontario, Newfoundland, India, France, Australia, Central Africa, Porto Rico, Brazil, Colombia.

Desmidium coarctatum Nordst. **Pl. XIV, fig. 79.**

Mobile, Alabama; Fishing Club, Smithtown, New York.

United States: New Hampshire, Florida; Newfoundland, Finland, Ceylon, Australia,

*Desmidium coarctatum var. cambricum West. Pl. XIV, fig. 78.

Ocean Springs, Mississippi.

Found only in Wales and Scotland.

Desmidium cylindricum Grev.

Castalian Lake, Durant, Mississippi.

United States: New Hampshire, Massachusetts, Connecticut, New York, Michigan, Colorado; Ontario, Canada; Europe, India, Ceylon, Australia, British Guiana, Brazil, Colombia, Paraguay.

*Desmidium occidentale W. and G. S. West

Mobile, Alabama.

Found previously in Scotland and Brazil.

Desmidium quadratum Nordst.

Gainesville, Florida; Cocoa, Florida; Mobile, Alabama; Birmingham, Alabama; Ocean Springs, Mississippi; Cold Spring Harbor, New York.

United States: New Hampshire, Louisiana; Europe, Newfoundland, Asia, Brazil, Australia.

Desmidium swartzii Agardh. Pl. XIV, fig. 69.

Pond west of Starkville, Mississippi; Baton Rouge, Louisiana; Birmingham, Alabama; Auburn, Alabama.

United States: New Hampshire, Massachusetts, Connecticut, Rhode Island, New York, North Carolina, South Carolina, Georgia, Florida, Pennsylvania, Ohio, Michigan, Indiana, Illinois, Wisconsin, Colorado, Alaska; widely distributed on other continents.

Gymnozyga moniliformis (Ehrenb.) Pl. XIV, fig. 81.

Starkville, Mississippi; Mobile, Alabama; Marcus Creek, Pensacola, Florida; sphagnum bog northwest of Woodberry, New York.

Cosmopolitan.

Gymnozyga moniliformis var. gracilens Nordst.

Mobile, Alabama.

Every continent but Africa.

Literature Cited

Allorge, P. and Denis, M. 1920.—Remarques sur la distribution des Algues dans le Haute-Maurienne. Bull. Soc. Bot. France 67: 77-90.

1923.—Une excursion phytosociologique aux lacs de Biscarrosse (Landes). Bull. Soc. Bot. France 70: 693-717.

Andrews, F. M. 1910.—A List of Algae. (Chiefly from Monroe County, Indiana). Proc. Indiana Acad. Sci. 1909: 375-380.

Bailey, Jacob W. 1851.—Microscopical Observations made in South Carolina, Georgia, and Florida. Smithsonian Contrib. to Knowl. ii art. 8, pp. 27-34. Washington.

Bailey, F. M. 1895.—Contributions to the Queensland Flora. Dept. of Agr., Brisbane. Bot. Bull. No. XI.

1898.—Contributions to the Queensland Flora. Dept. of Agr., Brisbane. Bot. Bull. No. XV.

Bessey, C. E. 1901.—The Modern Conception of the Structure and Classification of Desmids, with a Revision of the Tribes, and a Rearrangement of the North American Genera. Trans. Am. Micr. Soc. 22: 89-97.

1902.—Trans. Am. Micr. Soc. 23: 145-150.

Boldt, A. R. 1885.—Bidrag till kännedomen om Sibiriens Chlorophyllophyceer. Oefversigt Kongl. Svenska Vet. Akad. Foerhandl. 42: 91-128.

Borge, O. 1903.—Die Algen der ersten Regnell'schen Expedition. II: Desmidiaceen, III: Zygnemaceen und Mesocarpaceen. Arkiv. Bot. 1:71-139.

1906.—Algen aus Argentina und Bolivia. Arkiv. Bot. 6(4): 1-14.

1911.—Algologische Notizen 6. Susswasseralgen aus Queensland. Bot. Notiser 1911: 197-207.

1918.—Die von Dr. A. Löfgren in Sao Paulo gesammelten Susswasseralgen. Arkiv. Bot. 15(13): 1-108.

1921.—Die Algenflora des Takernsees. K. Svenska Vetensk. Akad 4. Stockholm 1921.

1925.—Die von Dr. F. C. Hoehne wahrend der Expedition Roosevelt-Rondon gesammelten Susswasseralgen. Arkiv. Bot. Bd. 19, No. 17.

Brannon, F. A. 1911.—Factors Influencing the Flora of Devil's Lake, North Dakota. Internat. Rev. Ges. Hydrobiol. u. Hydrograph. 1911. 4: 291.

Bruhl, P. and Biswas, K. 1926.—Algae of Loktak Lake. Mem. Asiatic Soc. Bengal 8: 257-316.

Carter, Nellie 1922.—Algae from New Caledonia. Jour. Linn. Soc. London. Bot. 46: 47-69.

1919.—Studies on the Chloroplasts of Desmids. I-IV. Ann. Bot. Vol. 33-34. 1919-1920.

1926.—Freshwater Algae from India. Records Bot. Survey India 9: 263-302.

Collins, F. S. 1909.—The Green Algae of North America. Tufts Coll. Stud. 2: 79-480.

1912.—Supp. Paper. Tufts Coll. Stud. 3: 69-109.

Comére, Joseph 1901.—Les Desmidiees de France Librairie des Sciences Naturelles. Paul Klincksieck, Paris.

Conn, H. W. and Webster, L. W. 1908.—A Preliminary Report on the Algae of the Fresh waters of Connecticut. Conn. Geol. & Nat. Hist. Survey. Bull. 10.

Cushman, J. A. 1903.—Desmids of Bridgewater, Massachusetts. Rhodora 5: 79-81.

1903.—Desmids from Bronx Park, New York. Bull. Torrey Bot. Club. 30: 513-515.

1903.—Notes on New England Desmids. Rhodora 5: 221-225.

1904.—Desmids from southwestern Colorado. Bull. Torrey Bot. Club. 31: 161-164.

1905.—The Desmid Flora of Nantucket. Bull. Torrey Bot. Club. 32: 549-563.

1905.—A Contribution to Desmid Flora of New Hampshire. Rhodora 7: 111-119, 251-266.

1905.—A Few Ohio Desmids. Ohio Nat. 5: 349-351.

1906.—New England Desmids of the sub-family Saccodermae. Bull. Torrey Bot. Club. 33: 343-351.

1906.—Some Desmids from Newfoundland. Bull. Torrey Bot. Club. 33: 607-615.

1907.—A Synopsis of New England species of Tetmemorus. Bull. Torrey Bot. Club. 34: 599-601.

1907.—A Synopsis of New England species of Pleurotaenium. Rhodora 9: 101-106.

1908.—A Synopsis of the New England species of Micrasterias. Rhodora 10: 97-111.

1908.—New England species of Closterium. Bull. Torrey Bot. Club. 35: 109-133.

Denis, M. 1924.—Observation Algologiques dans les Hautes-Pyrenees. Revue Algologique 1: 115-126.

Dickie, G. 1868.—Freshwater Algae. Included in the paper III Florula Discoana by Robert Brown. Trans. Edin. Bot. Soc. 9: 462-467.

Donat, Artur 1926.—Zur Kenntnis der Desmidiaceen des norddeutschen Flachlandes Pflanzenforschung 5: 1-51.

Ducellier, F. 1914.—Catalogue des Desmidiacees de la Suisse. Conservatoire et Jardin Botanique de Geneva. 18: 1-66.

1916.—Contribution à la étude de la flora desmidiologique de la Suisse. Bull. Soc. Bot. Geneve. 2d ser. 8: 29-79.

Fritsch, F. E. 1907.—The Subaerial and Freshwater Algal Flora of the Tropics. Ann. Bot. 21: 235-275.

1912.—Freshwater Algae of the South Orkneys. Jour. Linn. Soc. London Bot. 40: 293-339.

1914.—Contributions to our Knowledge of Freshwater Algae of Africa. I. Some Freshwater Algae from Madagascar. Ann. Biol. Lacust. 7: 40-59.

1918.—A Contribution to our Knowledge of Freshwater Algae of Africa. Ann. South African Museum 9: 483-611.

1923.—Contributions to our Knowledge of Freshwater Algae of Africa. 4. Freshwater and Subaerial Algae from Natal. Trans. Roy. Soc. South Africa 11: 297-398.

Fritsch, F. E. and Stephens, E. 1921.—Contributions to our Knowledge of the Freshwater Algae of Africa. Trans. Roy. Soc. South Africa 9: 1-73.

Gronblad, Rolf 1921.—New Desmids from Finland and Northern Russia. Acta Soc. Fauna et Flora Fennica 49: 1-78.

1925.—Einige Desmidiaceen aus Sibirien. Soc. Sci. Fennica. Commentationes Biologicae I, 8.

1926.—Beitrag zur Kenntnis der Desmidiaceen Schlesiens. Soc. Sci. Fennica. Commentationes Biologicae II, 5.

Handa, N. R. 1927.—A Contribution to our Knowledge of the Green Algae of Rangoon. Jour. Burma Res. Soc. 17: 259-269.

Hayden, Ada 1910.—The Algal Flora of the Missouri Botanical Garden. Ann. Rept. Mo. Bot. Garden, pp. 25-49.

Hazen, T. E. 1902.—The Ulothricaceae and Chaetophoraceae of the United States. Mem. Torrey Bot. Club. 11: 135-250.

Hedin, Sven 1922.—Southern Tibet. Discoveries in Former Times Compared with my own Researches in 1906-1908. In Algen aus Zentralasien, bearb. von E. Wille. Vol. VI. Part III: pp. 155-195. Stockholm.

Hodgetts, W. J. 1921.—Factors controlling the Periodicity of Freshwater Algae in Nature. New Phytol. 20: 150-164; 195-227.

1922.—New Phytol. 21: 15-33.

Hylander, C. J. 1922.—A Preliminary Report of the Desmids of Connecticut. Rhodora 24: 213-224; 236-241.

1924.—Supplementary Report of Desmids of Connecticut. Rhodora 26: 203-210.

1928.—The Algae of Connecticut. Conn. Geol. & Nat. Hist. Survey Bull. 42.

Johnson, L. N. 1894.—Some new and rare Desmids of the United States. Bull. Torrey Bot. Club 21: 285-291.

Joshua, W. 1886.—Burmese Desmidieae, with descriptions of new species occurring in the neighborhood of Rangoon. Jour. Linn. Soc. Bot. 21: 634-655.

Klugh, A. B. 1911.—The Algae of the Bruce Peninsula. Ottawa Naturalist Vol. 25, No. 6.

1913.—Notes on the Algae of Georgian Bay. Rhodora 15: 88-92.

Lagerheim, G. 1886.—Bidrag till Amerikar Desmidie-Flora. Oefversigt Kongl. Svenska Vet. Akad. Foerhandl. (1885) 225-255.

1887.—Algologiska Bidrag. II. Ueber einige Algen aus Cuba, Jamaica, and Puerto-Rico. Bot. Notiser 1887: 193-199.

Lewis, I. F. 1924.—Flora of Penikese. Rhodora 26: 211-222.

Migula, W. 1911.—Die Desmidiaceen Handbucher für die practische naturwissenschaftliche. Arbeit VI. Francklische Verlagshandlung, Stuttgart.

Miller, Clare R. 1915.—Fresh Water Algae in Vicinity of Montreal. Canadian Rec. Sci. 9: 291-425.

Mobius, M. 1893.—Beitrag zur Kenntnis der Algenflora Javas. Ber. Deut. Bot. Ges. 11: 118-139.

Moore, G. T. 1917.—Algological Notes. II. Preliminary List of Algae in Devil's Lake, North Dakota. Ann. Mo. Bot. Garden 4: 293-303.

Moore, G. T. and Carter, Nellie 1923.—Algae from Lakes in the Northeastern Part of North Dakota. Ann. Mo. Bot. Garden 10: 393-422.

Nordstedt, O. 1880.—De Algis et Characeis. 1. De algis nonnullis, praecipue, Desmidieis, inter Utricularias Musei Lugduno-Batavi. Ex. Act. Univ. Lund. Tome XVI.

1896.—Index Desmidiacearum citatiosibus locupletissimus atque Bibliographie, pp. 1-310.

Pascher, A. 1913.—Die Süsswasser-flora Deutschlands, Osterreichs und der Schweiz. Heft. 5-7, 9. Jena, G. Fischer, 1913-1921.

Playfair, G. I. 1915.—Freshwater Algae of Lismore District. Proc. Linn. Soc. New South Wales 40: 310-362.

Poteat, W. L. 1888.—A Preliminary List of North Carolina Desmids. Jour. Elisha Mitchell Sci. Soc. 5: 1-4.

Printz, H. 1915.—Beitrage zur Kenntnis der Chlorophyceen und ihrer Verbreitung in Norwegen. Skrifter Norske Videnskabers Selskab. 1915 Nr 2.

1915.—Contributions ad Floram Asiae Interioris Pertinentes. I. Die Chlorophyceen des Sudlichen Siberiens und des Uriankailandes. Skrifter Norske. Videnskabers Selskab. 1915 Nr 4.

Raciborski, M. 1895.—Die Desmideen flora des Tapakoomasees. Flora 81: 30-35.

Robbins, W. W. 1912.—Preliminary List of the Algae of Colorado. Univ. Colo. Stud. 9: 105-118.

Saunders, D. A. 1901.—Papers from the Harriman Alaska Expedition. XXV. The Algae. Proc. Wash. Acad. Sci. 3: 391-486.

Schaffner, J. H. 1901.—A List of Kansas Desmids. Ohio Nat. 1: 100-101.

Schaaraschmidt, J. 1886.—Notes on Afghanistan Algae. Jour. Linn. Soc. London Bot. 21: 241-250.

Schmidle, W. 1895.—Einige Algen aus Denver, Colorado, U.S.A. Hedwigia 34: 84-85.

1898.—Die von Professor Dr. Volkens und Dr. Stuhlmann in Ost Afrika gesammelten Desmidiaceen. Bot. Jahrb. 26: 1-59.

1901.—Einige Algen, welche Prof. Volkens aus den Carolinen gesammelt hat. Hedwigia 40: 342-349.

1901.—Algen aus Brasilien. Hedwegia 40: 45-55.

1902.—Beiträge zur Algenflora Afrikas. Bot. Jahrb. 30: 58-68.

Schmidt, J. 1902.—Flora of Koh Chang. Part IV by W. and G. S. West on Freshwater Chlorophyceae. Bot. Tidsskrift 24: 157-187.

Setchell, W. A. and Gardner, N. L. 1903.—Algae of Northwestern America. Univ. of Calif. Pub. Bot. 1: 165-418.

Skuja, H. 1928.—Vorarbeiten zu einer Algenflora von Lettland IV. Acta Horti Botanici Universitatis Latviensis III, 1928.

Smith, G. M. 1920.—Phytoplankton of the Inland Lakes of Wisconsin. Part I and II, Wisconsin Geol. and Nat. His. Survey, No. 57, 1920 and 1924.

1922.—Phytoplankton of the Muskoka Region, Ontario, Canada. Trans. Wis. Acad. Sci., Arts and Letters Vol. 20, 1922.

1924.—Plankton Algae of Palisades Park. Roosevelt Wild Life Bull. 2: 93-195.

Snow, Julia 1902.—The Plankton Algae of Lake Erie. Bull. U. S. Fish Com. 1902: 369-394.

Strom, K. M. 1919.—Freshwater Algae from Caucasus and Turkestan. Nyt Mag. Naturv. 57: 129-143.

1921.—Algological Notes. Nyt Mag. Naturv. 59: 1-14.

1921.—The Phytoplankton of some Norwegian Lakes. Skrifter Videnskabs-selskab, Olso. I. Mathem-Naturv. Klasse. 1921. No. 4.

1923.—The Alga-Flora of the Sarek Mountains. In Naturwissenschaftliche Untersuchungen des Sarekbirges in Schwedisch-Lappland, geleitet von A. Hamberg. Bd. III, Botanik, Lief. 5: 437-524.

1923.—Algological Notes V-IX. Nyt Mag. Naturv. 61: 127-138.

1924.—Studies in Ecology and Geographical Distribution of Freshwater Algae and Plankton. Revue Algologique 1: 127-156.

1926.—Norwegian Mountain Algae. Skrifter Norske Videnskaps-Akademi i Oslo. I. Mathem-Naturv. Klasse. 1926. No. 6.

1927.—Plankton from Finmark Lake. Aarshefter Tromsoe Museum. Vol. 49 (1926) Nr 1.

Taylor, W. R. and Colton, H. S. 1928.—The Phytoplankton of some Arizona Pools and Lakes. Am. Jour. Bot. 15: 596-615.

Taylor, W. R. and Fogg, J. M. 1927.—Notes on Some Freshwater Algae from Newfoundland. Rhodora 29: 160-164.

Thomas, M. B. 1899.—Some Desmids of Crawfordsville. Proc. Indiana Acad. Sci. 1898: 163-164.

Tilden, J. E. 1894.—List of Freshwater Algae Collected in Minnesota. Minn. Bot. Stud. 1: 25-32.

1910.—Minnesota Algae. Vol. 1, Minneapolis.

Transeau, E. N. 1913.—The Periodicity of Algae in Illinois. Trans. Am. Micr. Soc. 32: 31-40.

1916.—The Periodicity of Freshwater Algae. Am. Jour. Bot. 3: 121-133.

1917.—The Algae of Michigan. Ohio Jour. of Sci. 17: 217-232.

University of Nebraska. 1896.—Botanical Survey of Nebraska. IV. Report on Collections made in 1894-95. Pub. by the Seminar, January 1896.

Wailes, G. H. 1912.—Some Desmids from Alpine Stations in Colorado. Univ. Colo. Stud. 9: 119-120.

Webber, H. J. 1889.—The Freshwater Algae of the Plains. Am. Nat. 23: 1011-1013.

Wehrle, Emil 1927.—Studien über Wasserstoffionenkonzentrationsverhaltnisse und Besiedelung an Algenstandorten in der Umgebung von Frieburg i Br. Gustav Fischer, Jena.

West, W. 1888.—The Desmids of Maine. Jour. Bot. 26: 339-340.

1889.—List of Desmids from Massachusetts, U.S.A. Jour. Roy. Micro. Soc. London. 1889: 16-21.

1891.—Freshwater Algae of Maine. Jour. Bot. 29: 353-357.

West, W. 1895.—On Some Freshwater Algae from West Indies. Jour. Linn. Soc., London. Bot. 30: 264-281.

West, W. and G. S. 1895.—A Contribution to our Knowledge of Freshwater Algae of Madagascar. Trans. Linn. Soc. London, Botany. 2d ser. 5: 41-91.

1895.—New American Algae. Jour. Bot. 33: 52.

1896.—Algae from Central Africa. Jour. Bot. 34: 377-384.

1896.—On Some North American Desmidieae. Trans. Linn. Soc. London. Botany. 2d ser. 5: 229-275.

1897.—Welwitschs' African Freshwater Algae. Jour. Bot. 25: 1-7; 33-42; 77-89; 113-123; 172-183; 235-243; 264-272; 297-304.

1898.—On Some Desmids of United States. Jour. Linn. Soc. London. Bot. 33: 279-322.

1898.—Desmids from Singapore. Jour. Linn. Soc. Bot. 33: 156-166.

1898.—Observations on the Conjugatae. Ann. Bot. 12: 29-59.

1899.—A Further Contribution to the Freshwater Algae of West Indies. Jour. Linn. Soc. London. Botany 34: 279-295.

1909.—The British Freshwater Phytoplankton with special Reference to the Desmid-plankton and the Distribution of British Desmids. Proc. Roy. Soc. Bot. 81: 165-206.

1912.—On the Periodicity of the Phytoplankton of some British Lakes. Jour. Linn. Soc. London. Bot. 40: 395-432.

1916.—Algae. Vol. 1, Cambridge Bot. Handbooks, Cambridge Univ. Press.

West, W. and G. S. and (Vol. 5) Carter, Nellie 1904.—A Monograph of British Desmidiaceae. The Ray Society, London. Vol. I-V. 1904-1923.

West, G. S. 1899.—Variation in the Desmidieae. Jour. Linn. Soc. London. Bot. 34: 366-417.

1904.—West Indian Freshwater Algae. Jour. Bot. 42: 281-294.

1904.—A Treatise on the British Freshwater Algae. Cambridge Univ. Press.

1905.—Desmids from Victoria. Jour. Bot. 43: 252-254.

1912.—Freshwater Algae of Percy Sladen Memorial Expedition in Southwest Africa. 1908-1911. Ann. South African Mus. 9: 61-91.

1914.—A Contribution to our knowledge of Freshwater Algae of Columbia. Mem. Soc. Neuchat. Sci. Nat. 5: 1013-1951.

Wille, N. 1923.—Karplanter og Ferskvandsalger fra oerne Husoy, Ona og Rosholmen paa Nordmor. Nyt Mag. Naturv. 61: 53-89.

Wittrock, V., Nordstedt, O., Lagerheim, G. 1872.—A Contribution to the History of the Freshwater Algae of North America. Smithsonian Contrib. to Knowl. No. 241. Washington.

Plate XI

1. Pleurotaenium maximum var. tumidum nov. var. (2x scale)
2. Pleurotaenium subcornulatum var. detum W. and G. S. West
3. Pleurotaenium nodosum (Bail.) Lund.
4. Pleurotaenium ehrenbergii (Bréb.) DeBary
5. Spirotaenia obscura Ralfs
6. Netrium digitus (Ehrenb.) Itzigs and Rothe
7. Triploceros gracile Bailey
8. Closterium ehrenbergii Menegh.
9. Tetmemorus laevis (Kutz.) Ralfs.
10. Tetmemorus brebissonii (Menegh.) Ralfs
11. Closterium leibleinii Kutz.
12. Micrasterias radiata Hass.
13. Penium minutum var. gracile Wille.
14. Closterium decorum Bréb.
15. Closterium kutzingii Bréb.
16. Closterium intermedium var. hibernicum West
17. Pleurotaenium nodosum (Bail.) Lund.

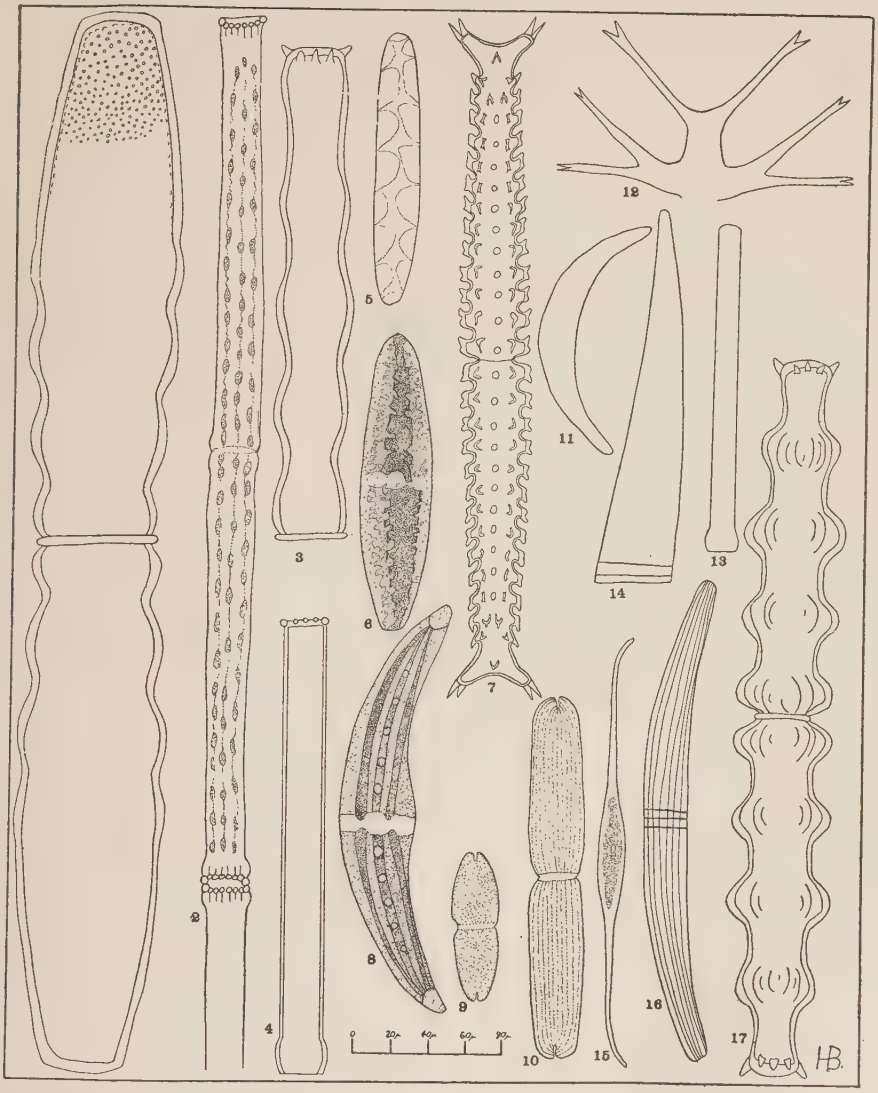


PLATE XI

Plate XII

18. Micrasterias truncata (Corda) Bréb.
19. Micrasterias foliaceae Bail.
20. Micrasterias laticeps Nordst.
21. Micrasterias sol var. ornata Nordst.
22. Micrasterias arcuata var. gracilis (Bail.) W. and G. S. West
23. Micrasterias sol (Ehrenb.) Kutz.
24-25. Micrasterias pinnatifida (Kutz.) Ralfs.
26. Micrasterias crux-melitensis (Ehrenb.) Hass.
27. Micrasterias mahabuleshwarensis Hobson.
28-29. Micrasterias truncata (Corda) Bréb.
30. Micrasterias radiata Hass.

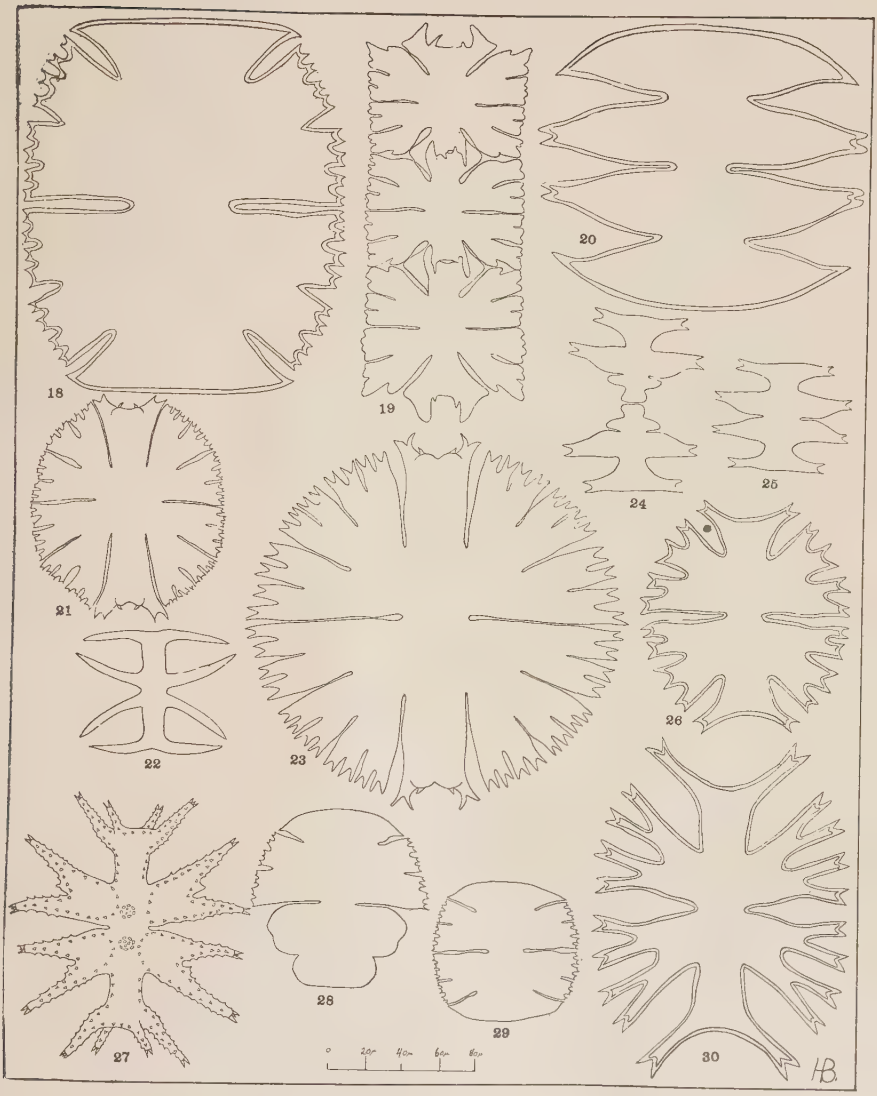


PLATE XII

Plate XIII

31-32. Euastrum wollei Lag.
33. Euastrum verrucosum var. coarctatum (Ehrenb.) Delp
34. Euastrum verrucosum var. alatum (Ehrenb.) Wolle
35. Cosmarium logiense Bissett
36. Cosmarium alpestre Roy and Biss.
37. Cosmarium portianum Archer
38. Cosmarium trachypleurum var. minus Racib.
39. Cosmarium pseudonitidula var. validum W. and G. S. West
40. Cosmarium pseudomoenum Wille
41. Cosmarium ovale Ralfs
42. Cosmarium margaritatum forma subrotundata W. and G. S. West
43. Cosmarium sexangulare Lund.
44. Cosmarium pyramidatum Bréb.
45. Cosmarium plicatum var. major Reinsch.
46. Cosmarium ochthodes var. amoebum West
47. Cosmarium isthmium West
48. Cosmarium punctulatum var. subpunctulatum (Nordst.) Borge
49. Cosmarium formosulum Hoff
50. Euastrum didelta (Turp.) Ralfs
51-52. Euastrum affine Ralfs
53. Xanthidium armatum (Bréb.) Rabenh.
54. Euastrum ansatum Ralfs
55. Euastrum gemmatum Bréb.
56. Euastrum bidentatum Nag.
57. Euastrum evolutum var. integrius W. and G. S. West
58-59. Euastrum verrucosum Ehrenb.
60. Xanthidium controversum W. and G. S. West
61. Xanthidium cristatum Bréb.
62. Xanthidium tetracentrotum Wolle
63. Arthrodesmus convergens Ehrenb.
64. Arthrodesmus incus var. validus W. and G. S. West
65. Euastrum pinnatum Ralfs.
66. Xanthidium antilopaeum (Bréb.) Kutz.
67. Euastrum oblongum (Grev.) Ralfs

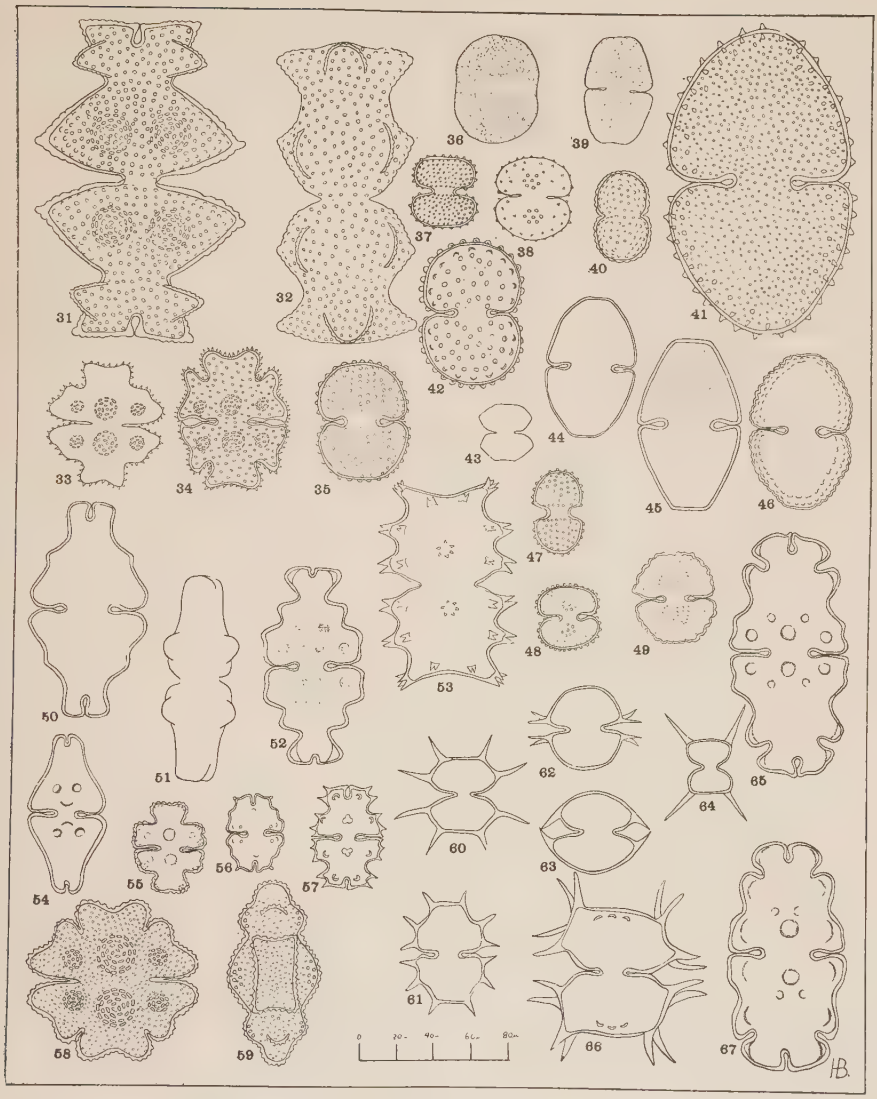

31
32
36
39
37
38
40
41
42
33
34
35
43
44
45
46
47
48
49
50
51
52
53
62
64
65
54
55
56
57
60
63
61
66
67
58
59
0
20
40
60
80
HB

PLATE XIII

Plate XIV

68. Spondylosium pulchrum (Bail.) Archer
69. Desmidium swartzii Agardh.
70. Hyalotheca mucosa (Mert.) Ehrenb.
71. Hyalotheca dissiliens (Sm.) Bréb.
72. Desmidium aptogonum Bréb.
73. Spondylosium planum (Wolle) W. and G. S. West
74. Cosmocladium pulchellum Bréb.
75. Pleurotaenium trochiscum W. and G. S. West
76-77. Staurastrum cerastes Lund.
78. Desmidium coarctatum var. cambricum West
79. Desmidium coarctatum Nordst.
80. Desmidium baileyii (Ralfs) Nordst.
81. Gymnozyga moniliformis Ehrenb.
82. Staurastrum ophiura var. cambricum (Lund.) W. and G. S. West
83. Staurastrum tohopekaligense Wolle
84-85. Staurastrum gladiosum Turner
86. Staurastrum oxyacanthum Archer
87. Staurastrum inconspicuum var. crassum Gay
88. Staurastrum vestitum var. semivestitum West
89. Staurastrum oligacanthum Bréb.
90. Staurastrum brasiliense var. lundellii W. and G. S. West
91. Staurastrum anatinum Cooke and Wills
92. Pleurotaenium coronatum var. fluctuatum West
93. Staurastrum vestitum Ralfs

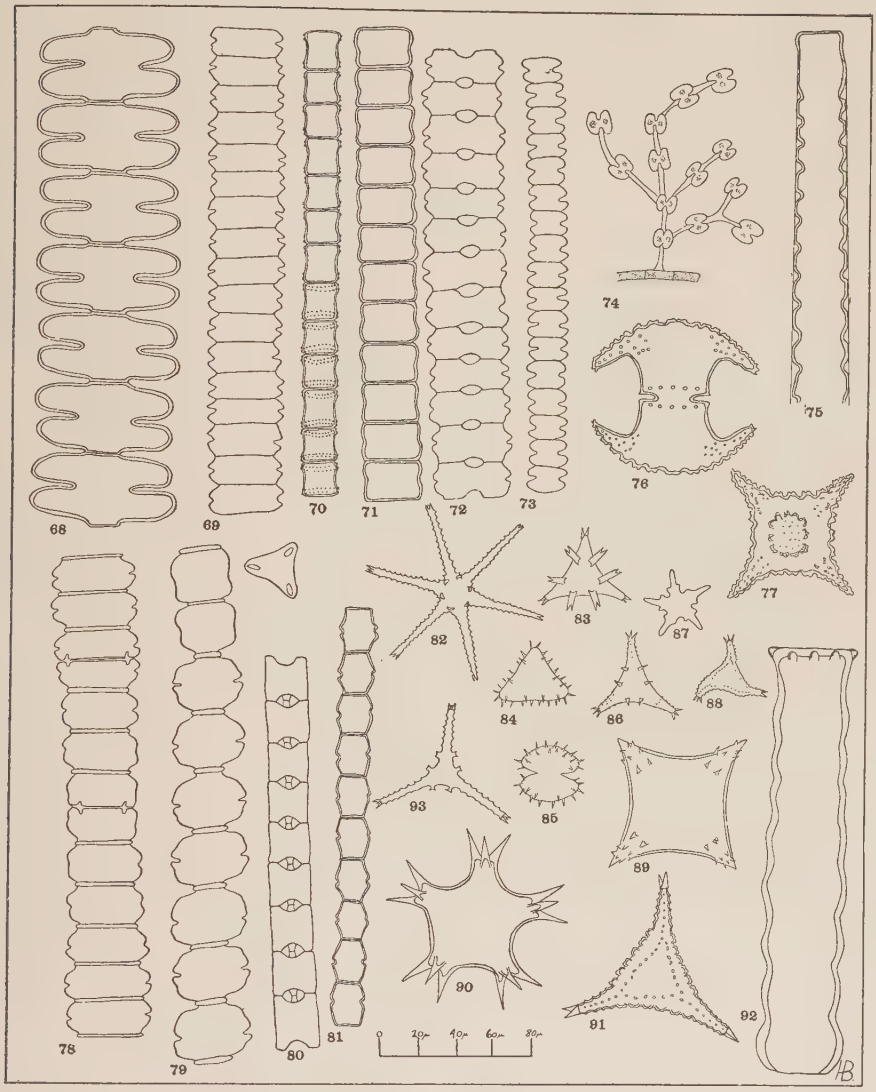

68
69
70
71
72
73
74
75
76
77
78
79
80
81
82
83
84
85
86
87
88
89
90
91
92
93
20μ
40μ
60μ
80μ
AB

PLATE XIV

BIOGRAPHY

Helen Jean Brown was born in Beaumont, Texas, August 9, 1903. She received her secondary education in West High School, Akron, Ohio. She matriculated at the University of Buffalo, Buffalo, N. Y. in the autumn of 1921. She transferred to The Ohio State University in 1923, and received from that institution the degree of Bachelor of Arts in June 1925, and the degree of Master of Arts in August 1925. From 1925-1928 she taught Chemistry, Botany and Zoology at St. Mary of the Springs College, East Columbus, Ohio. During this period of teaching she continued as a graduate student at The Ohio State University. She spent the summer of 1926 at the Marine Biological Laboratory, Woods Hole, Mass. studying the Marine Flora under Dr. T. E. Hazen, of Columbia University, Dr. I. F. Lewis, of the University of Virginia, and Dr. W. R. Taylor, of the University of Pennsylvania. Nine weeks of the summer of 1927 were spent on the Pacific coast at the Puget Sound Biological Laboratory, Friday Harbor, Wash., studying Cytology and Microtechnique under Dr. Charles J. Chamberlain of the University of Chicago. The year 1928-1929 was devoted entirely to study and research at The Ohio State University. She recently published a taxonomic paper on the Algal Family Vaucheriaceae (Trans. Am. Mic. Soc. 48 : 86–117, Pl. 1–6, figs. 41, January 1929).